NAVAL POSTGRADUATE SCHOOL
Monterey, California

THESIS

A Comparison of Alternative Measures of the Qualified Military Available and Interested Recruit Market

by

David S. Schulz

March 1993

Principal Advisor: George W. Thomas
Associate Advisor: Kathryn M. Kocher

Approved for public release; distribution is unlimited.

Unclassified

Security Classification of this page

REPORT DOCUMENTATION PAGE

1a Report Security Classification: Unclassified			1b Restrictive Markings	
2a Security Classification Authority			3 Distribution/Availability of Report	
2b Declassification/Downgrading Schedule			Approved for public release; distribution is unlimited.	
4 Performing Organization Report Number(s)			5 Monitoring Organization Report Number(s)	
6a Name of Performing Organization Naval Postgraduate School	6b Office Symbol *(if applicable)* 36		7a Name of Monitoring Organization Naval Postgraduate School	
6c Address *(city, state, and ZIP code)* Monterey, CA 93943-5002			7b Address *(city, state, and ZIP code)* Monterey, CA 93943-5002	
8a Name of Funding/Sponsoring Organization	8b Office Symbol *(if applicable)*		9 Procurement Instrument Identification Number	
Address *(city, state, and ZIP code)*			10 Source of Funding Numbers	
			Program Element No / Project No / Task No / Work Unit Accession No	

11 Title *(include security classification)* A COMPARISON OF ALTERNATIVE MEASURES OF THE QUALIFIED MILITARY AVAILABLE AND INTERESTED RECRUIT MARKET

12 Personal Author(s) David S. Schulz

13a Type of Report	13b Time Covered	14 Date of Report *(year, month, day)*	15 Page Count
Master's Thesis	From To	1993, March	144

16 Supplementary Notation The views expressed in this thesis are those of the author and do not reflect the official policy or position of the Department of Defense or the U.S. Government.

17 Cosati Codes			18 Subject Terms *(continue on reverse if necessary and identify by block number)*
Field	Group	Subgroup	Recruiting, Recruit Market, Qualified Military Available, QMA, PQMA, HQ QMJ

19 Abstract *(continue on reverse if necessary and identify by block number)*

This thesis compares two alternative measures of recruit market potential: Production-Weighted Qualified Military Available (PQMA) and High-Quality Qualified Military Available and Interested (HQ QMJ). The services rely on estimates of market potential to allocate recruiting resources efficiently and establish enlistment goals. Using 1990 accession data, regression and correlation analysis were used to determine the relationship between accessions and estimated market potential for both all services and Marine Corps accessions with the following results: (1) the relationship between actual accessions and the PQMA and HQ QMJ estimates of market potential differs by race/ethnic group, market size and region, (2) there are differences in the relationship between actual accessions and estimates of recruit market potential both for all services and Marine Corps accessions, (3) counties with significant variation between PQMA and HQ QMJ estimates of market potential were identified, and (4) 1990 PQMA and HQ QMJ estimates of market potential did not adequately account for differences in the qualification and propensity to enlist by region and socioeconomic status. Recommendations for further research in the area of recruit market potential include applying the methodology in this study to several years of accession data, applying the 1990 census population and socioeconomic information to the PQMA and HQ QMJ estimates of market potential, and examining the counties identified in this study having substantial variation in the measures of market.

20 Distribution/Availability of Abstract	21 Abstract Security Classification	
XX unclassified/unlimited __ same as report __ DTIC users	Unclassified	
22a Name of Responsible Individual George W. Thomas	22b Telephone *(include Area Code)* (408) 656-2741	22c Office Symbol As/Te

DD FORM 1473,84 MAR 83 APR edition may be used until exhausted

All other editions are obsolete

security classification of this page

Unclassified

Approved for public release; distribution is unlimited.

A Comparison of Alternative Measures of the
Qualified Military Available and Interested
Recruit Market

by

David S. Schulz
Captain, United States Marine Corps
B.S., Villanova University, 1987

Submitted in partial fulfillment
of the requirements for the degree of

MASTER OF SCIENCE IN MANAGEMENT

from the

NAVAL POSTGRADUATE SCHOOL
March 1993

Author: _____
David S. Schulz

Approved by: _____
George W. Thomas, Principal Advisor

_____
Kathryn M. Kocher, Associate Advisor

_____
David R. Whipple, Chairman
Department of Administrative Sciences

ABSTRACT

This thesis compares two alternative measures of recruit market potential: Production-Weighted Qualified Military Available (PQMA) and High-Quality Qualified Military Available and Interested (HQ QMJ). The services rely on estimates of market potential to allocate recruiting resources efficiently and establish enlistment goals. Using 1990 accession data, regression and correlation analysis were used to determine the relationship between accessions and estimated market potential for both all services and Marine Corps accessions with the following results: (1) the relationship between actual accessions and the PQMA and HQ QMJ estimates of market potential differs by race/ethnic group, market size and region, (2) there are differences in the relationship between actual accessions and estimates of recruit market potential both for all services and Marine Corps accessions, (3) counties with significant variation between PQMA and HQ QMJ estimates of market potential were identified, and (4) 1990 PQMA and HQ QMJ estimates of market potential did not adequately account for differences in the qualification and propensity to enlist by region and socioeconomic status. Recommendations for further research in the area of recruit market potential include applying the methodology in this study to several years of accession data, applying the 1990 census population and socioeconomic information to the PQMA and HQ QMJ estimates of market potential, and examining the counties identified in this study having substantial variation in the measures of market.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

I. INTRODUCTION

A. ARMED FORCES RECRUITING

The military's demand for new accessions has decreased as a result of downsizing and force reductions. However, the trend is for the services to become "smaller but smarter." Advances in equipment and the introduction of computers and technology at all levels of the battlefield require recruits with the education and aptitude necessary to meet the demands of high-tech equipment.

The services continue to recruit actively from the "high quality market" in direct competition with institutions of higher learning, particularly junior and community colleges. Reduced budgets have pressured the services to economize recruiting resources (recruiters and facilities). The services are also faced with a projected decline in the size and quality of the youth population. Therefore, the efficient assignment of recruiters, equitable allocation of recruiting goals, and effective use of limited advertising resources require a detailed knowledge of the current and future markets for youth qualified for military service at the local geographic region (county) level. This market is often referred to as the "qualified military available" or QMA.

B. QUALIFIED MILITARY AVAILABLE

The services, in conjunction with military-supported research agencies, have developed several measures of the local recruit market. The measures are designed to estimate the "qualified military available" (QMA) which is defined as the number of 17-21 year old male, high school graduates who have scored in the upper 50th percentile of the Armed Forces Qualification Test (AFQT) and meet the moral and medical requirements for military service.

Figure 1 displays estimates of the military available base population (17 to 21 year old males, the forecasted high school graduate population, and the population scoring in mental categories I-IIIA and I-IIIB on the Armed Forces Qualification Test for 1984-1990. The estimates show a decline in the population of youths qualified for military service (Curtis, Borack, and Wax, 1987).

C. QUALIFIED MILITARY INTERESTED

A subset of QMA is the "qualified military interested" (QMI). QMI is the number of 17-21 year old male, high school graduates who are interested in joining the military. Several studies have established that people who say they are interested in the military enlist at higher rates than those who say they are not interested. Therefore, adjusting QMA for interest levels is likely to produce more accurate measures of the potential market. The benefit of accurate estimates of

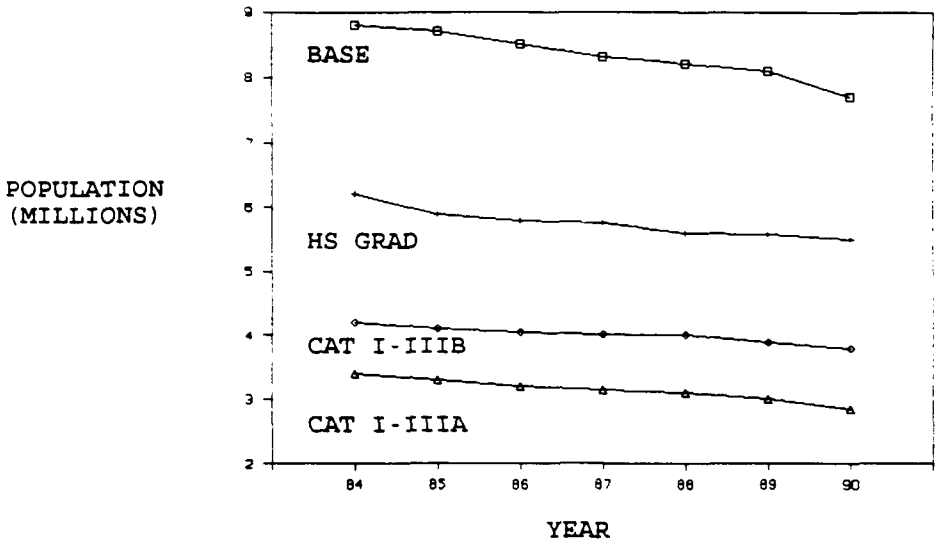

Figure 1. Estimates of Base (17 TO 21 Year Old Males), High School Graduates, AFQT Category I-IIIB, and AFQT Category I-IIIA Populations, 1984-1990[1]

QMI to recruiting managers are obvious. For example, in an area where the most high school graduates continue on to college, the use of raw qualified military available may overestimate market potential as those qualified have little, if any, interest in enlistment. Recruiting managers could use a measure of QMI to allocate resources better and concentrate recruiters in areas where not only is the youth population qualified and available for service, but also interested in the military. (Thomas and Gorman, 1991)

[1]Source: Curtis, Borack, and Wax, 1987.

D. OBJECTIVE

The services face the challenge of smaller recruiting budgets and force reductions while still committed to improving the quality of recruits. The services rely on estimates of the qualified military available and interested market to assign recruiting resources efficiently and allocate recruiting goals. The objective of this thesis is to examine two recruit market potential estimates to determine which measure most accurately predicts actual accession data. The estimates used in this study are 1) High-Quality Military Available and Interested and 2) Production-Weighted Qualified Military Available.

E. RESEARCH QUESTIONS

Estimates of recruit market potential will be compared to actual accessions from 1990. Accessions in 1990 were derived from the 1990 Active Duty Military Inventory (ADMI) Master File provided by the Defense Manpower Data Center. Data from 1990 was chosen to avoid any change in youth attitudes to the military caused by force reductions and the country's involvement in the Persian Gulf War.

The primary research question is "Which recruit market estimate of qualified military available best reflects actual accession data?" The subsidiary questions are: (1) "What are the current estimates of QMA/QMI used by the services and related research centers?", (2) "Do the estimates of QMA/QMI

logically account for factors related to accessions (economic trends, youth labor market, availability of higher education, etc.)?" and (3) "How well do QMA/QMI estimates accurately reflect historical accession data?"

F. SCOPE, LIMITATIONS AND ASSUMPTIONS

The thrust of this study is to compare estimates of the recruit market potential of a local geographic region. The basis for comparison will be estimates of male, 17-to-21 year old qualified military available and/or interested at the county level against 1990 accessions. A second comparison will be made for each estimate using 1990 Marine Corps accessions. Women have been eliminated from the data set because the Armed Services have had little difficulty in recruiting qualified women in the past nor are they expected to in the future. This study does not attempt to differentiate the propensity to enlist in one service over another, i.e., in the Marine Corps versus the Army.

Accession data for the Marine Corps was chosen for the basis of the second comparison based on the assumption that not all services allocate recruiting resources efficiently. Bicaksiz (1992) determined each service's index of market potential utilization and found the Marine Corps to be the most effective in taking geographic variation of the military available population into account when allocating its

recruiting resources.[2] Bicaksiz found the Army and Navy had utilized the recruit market potential at rates comparable to the average of all services while the Air Force had the lowest utilization rate.

[2]Bicaksiz based the index of market potential utilization on the High Quality Military Available and Interested Estimate (Thomas and Gorman, 1991).

II. LITERATURE REVIEW

The advent of the all-volunteer force in 1973 forced the services to recruit individuals actively for all personnel requirements. No longer could the services rely on draftees or draft-induced volunteers to fill the ranks. Efficient assignment of recruiters, equitable allocation of recruiting goals, and effective use of limited advertising resources required a detailed knowledge of the geographic location and size of the current and future markets for young men qualified for military service.

A. THE DECLINING YOUTH POPULATION

Kocher and Thomas (1991) have forecast a decline in the size and quality as well as a change in the racial distribution of the youth (16-24) labor force. Declining fertility and birth rates combined with effects of immigration have brought about slow population growth in the United States. As shown in Table 1, the youth population is expected to decrease until 1995 and then increase slowly through 2010. The youth population is then expected to decrease again through 2080. The racial mix of the youth population will also change. The percentage of nonwhites is expected to grow from 17.9 percent of the youth population in 1990 to 25.1 percent of the youth population in 2080.

TABLE 1. SIZE AND RACIAL DISTRIBUTION OF YOUTH (AGE 18-24), PROJECTIONS TO 2080

Year	Youth Pop 000,000	Percent Youth, Total Pop	Percent Nonwhite, Total Pop	Percent Nonwhite, Youth Pop
1990	25.8	10.3	15.6	17.9
1995	23.7	9.1	-----	-----
2000	24.6	9.2	16.9	18.7
2010	27.7	9.8	18.3	19.5
2030	26.2	8.6	20.7	20.6
2050	25.7	8.3	23.0	23.5
2080	25.3	8.1	25.5	25.1

Source: Based on middle series (moderate) estimates of Tables II-4 and II-5 in Kocher and Thomas, 1991, pp. 27-28.

The quality of the future youth labor force is also expected to decline. Kocher and Thomas (1991) point out that recent downward trends in high school completion rates, college enrollment rates, and standardized test scores (the Scholastic Aptitude Test and the American College Testing Program Assessment) indicate the overall quality of the youth labor force will fall. As the quality of the youth labor force declines, the proportion who are qualified for military service will also decline. The shrinking market of youths qualified for military service will make recruiting more difficult.

B. THE NEED FOR QUALITY RECRUITS

The requirement for better quality enlistees was necessitated by the infusion of technologically advanced weapons systems in the military in the mid-1970's. Complex command and control hardware, optics, and wire-guided munitions are just some examples of the types of systems introduced to all levels of the force. Recruiting commands were tasked with providing adequate numbers of individuals to fill the need to operate and maintain this new high-tech equipment.

The early 1980's found the United States faced with recessionary high unemployment rates. At the same time, the Reagan administration increased the Department of Defense budget to provide not only for procurement of additional equipment and technology, but for substantial increases in the pay and benefits of military personnel. The services were inundated with high quality individuals enlisting for military service. Figure 2 displays how the percentage of high quality male recruits enlisted by the Army increased from 1980 to 1985.

However, by 1984 the economy was growing vigorously, and unemployment rates were in the mid-7 percent range. With renewed competition from the private sector and a declining population available and qualified for military service, the services were faced with either reducing their high-quality accessions or justifying more recruiting resources (pay,

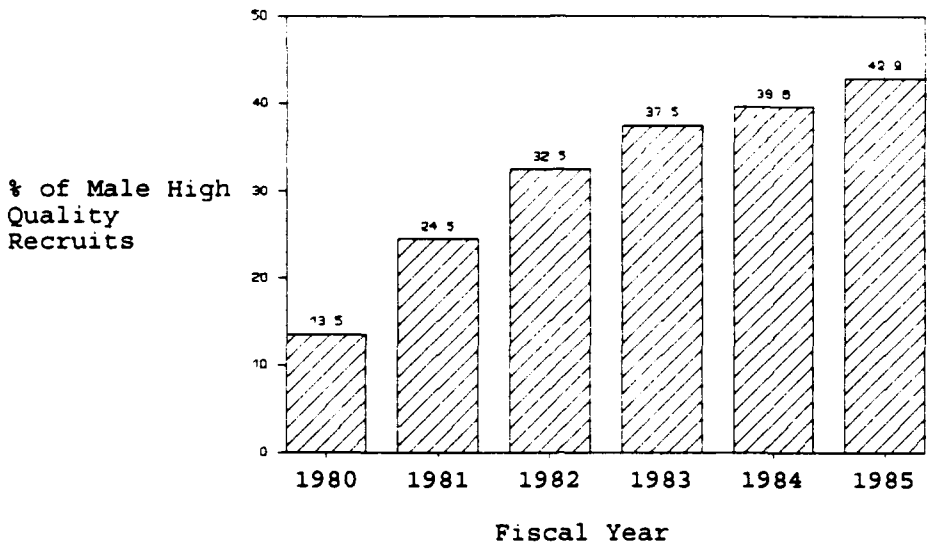

Figure 2. High Quality Male Accessions As Percent of Total Army Accessions, 1980 to 1985.

Source: Horne, 1987, citing U.S. Army Recruiting Command.

advertising, recruiters) to maintain their position in the market for top-quality recruits. Policy makers wondered if high quality recruits are worth their additional cost.

Several studies were conducted to determine the relationship between enlistment criteria and performance. The primary question is whether the cost of recruiting a high-quality individual is justifiable in terms of increased performance. Scribner, *et al*, (1986) studied the impact of AFQT score on tank crew performance. They found that soldiers with higher AFQT scores performed better than those with lower AFQT scores on a standardized tank gunnery range.

Horne (1987) tested the relationship of AFQT score and performance using cohorts from fifteen different military occupational specialties (MOS) from such diverse skills as infantryman, stenographer, military policeman, and Hawk missile crewman. Horne concluded that AFQT score is a significant predictor of performance in the Army; soldiers with higher AFQT scores performed better than soldiers with lower AFQT scores with the same rank and experience level.

C. PREVIOUS MARKET POTENTIAL ESTIMATES

The services relied on Bureau of the Census population estimates and past experience to allocate recruiting resources in the early 1970's. Borack and Govindan (1978) used Bureau of the Census reports on population and expected trends in the youth labor market to estimate recruit market potential. Borack (1978 and 1982) used telephone surveys to determine the enlistment intentions of men and women aged 18-25 and applied the results to Bureau of the Census projections to estimate market potential.

The use of census data in measuring recruit market potential was enhanced by subdividing the base population of a geographic region by age, racial/ethnic group, and gender. High school completion rates were applied to the estimated population of each racial/ethnic group to determine the number of males who had completed high school and were considered available for military service. However, the lack of adequate

demographic data at the local regional level prevented meaningful geographically-disaggregated estimates of qualified military available (QMA) populations.

D. GEOGRAPHIC VARIATION IN MENTAL ABILITY

In 1980 the Department of Defense, in conjunction with the Department of Labor, administered the Armed Forces Qualification Test (AFQT) to a representative sample of 11,878 youths as part of the National Longitudinal Survey of Youth (NLSY). From the sample, known as the Profile of American Youth, estimates of the percentage of individuals in each AFQT category were possible. The AFQT is used by the services to determine whether a potential enlistee is "educationally qualified" and also as a measure of "trainability." Table 2 provides the percentile score required of each category and the corresponding level of trainability. Data from this sample were merged with individual respondent data from the NLSY. This large set of variables was analyzed to identify those that were highly correlated with AFQT scores and were available at the county level from other sources (e.g., Census files). Curtis, Borack and Wax (1987) found that the most highly correlated variable was race/ethnicity. This finding indicated that QMA could be estimated more accurately by accounting for a geographic area's (county) racial/ethnic mix. Other variables found highly correlated with AFQT and

available at the county level included level of education and socioeconomic status (e.g., Father's occupation).

TABLE 2. ARMED FORCES QUALIFICATION TEST (AFQT) CATEGORIES BY CORRESPONDING PERCENTILE SCORES AND LEVEL OF TRAINABILITY

AFQT CATEGORY	PERCENTILE SCORE	LEVEL OF TRAINABILITY
I	93-99	Well above average
II	65-92	Above average
IIIA	50-64	Average
IIIB	31-49	Average
IV	10-30	Below average
V	1-9	Well below average

Source: Mark J. Eitelberg, Manpower For Military Occupations, Office of the Assistant Secretary of Defense (Force Management and Personnel), 1988, p 74.

Several studies have been conducted on the relationship between test score on the Armed Forces Qualification Test (AFQT) and commonly available social and economic characteristics. Generally, it was found that:[3]

1) mean scores for whites exceed those of Hispanics, which in turn, exceed those of blacks,

2) scores for young adults are positively related to age and educational attainment,

3) mother's education and scores are positively correlated, and

[3]Thomas and Gorman (1991) citing Bock, R. Darrell and Elsie G.J. Moore, Profile of American Youth: Demographic Influence on ASVAB Test Performances, Office of the Assistant Secretary of Defense (Manpower, Installations and Logistics), 1984; Behrendt, *et al*, "Selectivity Bias and the Determinants of SAT Scores," Economics of Education Review, Vol. 5, No. 4, 1986; Curtis, Borack, and Wax (1987); and Orvis and Gahart (1989).

4) people from the Northeast census region have the highest mean score while those in the South have the lowest.

Curtis, Borack and Wax of the Navy Personnel Research and Development Center applied the knowledge gained in the research on geographic variation in mental qualification to develop the QMA estimate that the Marine Corps used from 1988 to 1990. This estimate is based on the 1980 census, the Profile of American Youth data base of the NLSY, and empirical disqualification rates to correct for medical standards. The QMA estimate is based on a county-clustering approach which relies on regression-based predictors of scores. The estimate is given by mental group category at the county level and at higher levels of geographical aggregation appropriate for the Marine Corps recruiting organization. Because they are produced at the county level, they can be aggregated to represent any of the four services' recruiting regions.

A weakness of the estimate is the failure to consider the intention to enlist. The estimate will not take into account, for example, the low enlistment intentions of males age 17-to-21 resident in a county where a large university is located. Table 3 summarizes the enlistment yield for selected counties. Enlistment yield is the ratio of the number of QMA accessions (17-to-21 year old male high school graduates scoring in the categories I-IIIA on the AFQT) to the estimated QMA population for a given year and locality.

TABLE 3. SUMMARY OF ENLISTMENT YIELD, MALE AFQT I-IIIA, 1981-1987, FOR SELECTED COUNTIES

MEAN YIELD[a]	COUNTY AND STATE
.01	Brazos TX
.03	Westchester NY, DuPage IL, Orange CA, San Diego CA
.04	Baltimore County MD, Riverside CA
.05	Kings NY, Harris TX, Cook IL
.06	Galveston TX
.07	Washington, D.C.
.08	Bronx NY

Note [a]: Average enlistment yield for 1981-1987. Enlistment yield is the ratio of actual number of male, 17-to-21 year old high school graduates scoring in AFQT categories I-IIIA to the estimated number of male, 17-to-21 year old high school graduates scoring in categories I-IIIA.

Source: Based on Horne, Hughes, and Sims (1990), Table 5.

The counties shown in Table 3 were selected for their geographic diversity and tend to be nationally known. All have a relatively large base population of 17-to-21 year old males. Holding constant other factors which influence propensity to join the military, Brazos County, a clear outlier, discloses the inability of this QMA estimate to consider the intention to enlist. Brazos County is the home of Texas A&M University and the university population comprises a large part of the county population. Although many of them are included in the QMA estimate,[4] most of the

[4]Students enrclled in a university but not living in dormitories are included in the QMA estimate for a locality.

university students have already decided to attend school rather than enlist in the military. Curtis, Borack and Wax also suggest caution in the use of individual county QMA estimates because of insufficient sample size and the unavailability of some county-level data.

E. CURRENT ESTIMATES USED BY SERVICES

Each service currently uses a different estimate of market potential in allocating recruiting resources and determining the number of recruits each geographic region should yield for enlistment.

1. Army

The U.S. Army Recruiting Command estimates the total male population from 17-to-21 years old as a measure of local market size. No adjustment is made for geographic variation in mental, moral, or physical qualifications. Another weakness of the estimate used by the Army is that no consideration is given to differences in the propensity to enlist across geographic regions.

2. Navy

The U.S. Navy Recruiting Command uses population estimates adjusted for geographic variation in mental qualification. They are measuring market size using an estimate that incorporates geographic variation in mental qualification called regional High-Quality Military Available

(HQ QMA). A weakness of this estimate is that there is no adjustment made for the propensity to enlist by mental category or geographic location.

3. Air Force

The Air Force estimates market potential using a technique similar to that of Curtis, Borack and Wax (1987). The estimate begins with the raw population of 17-to-21 year olds as provided by the Bureau of the Census. The Profile of American Youth data set is then applied to determine the geographic variation in mental qualification. To be considered "mentally qualified" a potential recruit must score a minimum of 44 on the General Science subtest of the Armed Services Vocational Aptitude Battery (ASVAB) and a minimum combined score of 185 on the General Science, Arithmetic Reasoning, Mechanical Comprehension and Electronics Information subtests of the ASVAB. This minimum score disqualifies all potential recruits with Category IV scores and approximately 50% of the potential recruits in Category IIIB.

Once the mental qualification rate is applied to each geographic region, the Air Force then subtracts 15% considered to be not medically qualified. An Air Force Study (1985) on juvenile delinquency rates determined that 95.2% of men and 98.4% of women in the United States are considered morally qualified for service. These rates are applied to the

estimates to determine the number of 17-to-21 year olds mentally, medically and morally qualified for service in the Air Force by race/ethnic group, gender, and geographic region. As with the Army and Navy estimates of qualified military available, little or no consideration is given to the propensity to enlist or the variation in propensity to enlist by geographic region.[5]

4. Marine Corps

As mentioned previously, the Marine Corps used the estimate of qualified military available developed by Curtis, Borack and Wax (1987) of the Naval Personnel Development and Research Center from 1983 to 1990. In an effort to incorporate propensity to enlist in county-level estimates of qualified military available, the Marine Corps adopted the use of Production-Weighted Qualified Military Available (PQMA). A detailed discussion of PQMA is included in the next section.

F. ESTIMATES USED IN COMPARISON

Two estimates of recruit market potential will be compared to determine which best forecasts actual accession data. A detailed discussion of each estimate used in the comparison follows.

---

[5]Information concerning the Air Force estimate of QMA was provided in an interview with George Germadnik of the U.S. Air Force Recruiting Service.

1. High-Quality Military Available and Interested

The High-Quality Military Available and Interested (HQ QMJ) estimate of recruit market potential developed by Thomas and Gorman (1991) takes into account moral and medical qualification rates as well as geographic variation in mental qualification. HQ QMJ also accounts for the propensity to join the military based on AFQT mental group.

Research on variation in moral and medical qualification rates is limited. "Morally qualified" means that a potential recruit does not have a criminal record that would render him unfit for military service. One of the few estimates of juvenile delinquency rates is contained in a U.S. Air Force study (1985) which provides estimates of national delinquency rates by gender. Estimates are not available by age, geographic region, race or mental category. The study shows that 95.2% of men and 98.4% of women are morally qualified for military service.

Estimates of medical qualification rates for service were analyzed by Laurence (1988) using data from the National Health and Nutrition Examination Survey, 1976-80 (NHANES II). NHANES II qualification rates by race and gender are shown in Table 4. The table shows that medical qualification rates are generally lower for minority women. Note the medical disqualification rate used by Curtis, Borack and Wax (1987) of 14% and the rate used by the Air Force of 15% is substantially lower than the NHANES II rates.

TABLE 4. MEDICAL QUALIFICATION RATES BY RACE AND GENDER

	White	Black	Hisp
Male	75.9	72.1	69.3
Female	75.4	59.7	62.2

Source: Laurence, Michael T., John W Overby, II, and Phillip E. Winter, The Medical Fitness of American Youth For Military Service, Arlington, VA: Defense Manpower Data Center, 1988.

The estimate of high-quality qualified military available and interested in joining the military (HQ QMJ) begins with an estimate of the high-quality qualified military available high school graduate population for each market segment. The twelve segments are 17-21 and 22-29 year old males and females divided by race/ethnicity (white/other, black, and Hispanic). The medical and moral qualification rates from the Air Force Personnel Composition Study and Laurence's examination of NHANES II data were used to estimate the proportion of each group by race and gender that would be morally and medically qualified for military service. A regression equation was used to estimate the number of high school graduates likely to score in categories I-IIIA on the AFQT using county characteristics[6]. The estimate of HQ QMA in a county for each market segment j is given by:

[6]On a nationwide basis, local area data are available on population, personal income by major source, earnings by industry, and unemployment.

$$\text{HQ QMA}_j = (\text{estimate of civilian high school graduates}_j) \times (\text{proportion morally qualified}_j) \times (\text{proportion medically qualified}_j) \times (\text{proportion in categories I-IIIA in county j given county characteristics})$$

Analysis of the HQ QMA estimates shows that 17.1% of the 17-21 year old resident population of military available high school graduates in the continental United States constitutes the high quality market. At the county level, the percentage of the high quality market varies by county. For example, 23.7% of the male, 17-21 year old residents in Johnson County, Kansas are in the high quality market, while El Paso County, Texas had only 12.3% of its male, 17-to-21-year-old resident population in the same high-quality market.

A regional HQ QMA index was created to allow easy comparison of the 17-to-21-year-old resident population in the HQ market. The ratio of HQ QMA to resident population was normalized to a mean of 100 and a standard deviation of 25. For example, the HQ QMA index for Johnson County, KS is 138 while the index for El Paso County, TX is 75.

The next step in developing the HQ QMJ estimate is accounting for the relationship between interest in joining the military and actual enlistment. Using data from the Youth Attitude Tracking Survey (YATS), Orvis (1984, 1984, and 1986) and Orvis and Gahart (1985) found that people who say they are interested in the military enlist at a higher rate than those who say they are not interested. Therefore, developing a

model to adjust QMA for interest is likely to produce a more accurate measure of market potential.

Thomas and Gorman (1991) used NLSY data and a four choice ordered logistic model with the probability of the level of interest in the military as the ordinal dependent variable. The four possible levels of interest were "definitely try to enlist, "probably try to enlist," "probably not try to enlist," and "definitely not try to enlist." Models were estimated separately for men and women, and dummy variables were used to account for racial differences. Mental group, age, parents' education, and poverty level were the explanatory variables.

Results of the regression show that for men, being black, Hispanic, in poverty, in mental category IIIA or in a mental category below IIIB increased interest in the military. Results for women were similar with the only exception being the coefficient for the dummy variable for membership in mental categories I or II was also statistically significant at the 1% level.

The probability of being in each of the four interest groups was calculated for three possible values of race, four possible values of mental category, and two possible values each for poverty status and age group. A total of 48 different groups were defined. The probabilities for each case were estimated using logistic regression coefficients

given the set of dummy variables defined for each group. An estimate for the number of qualified military interested (QMI) was arrived at by multiplying the number of people in each group by the estimated probability of having one of the four levels of interest.

Thomas and Gorman (1991) used the National Longitudinal Survey of Youth to explore the relationship between interest in the military and actual enlistment. As expected, the data suggest that enlistment rates for men differ by race and stated level of interest. Approximately 12% of the men who said they would definitely enlist actually did so. About 2% of those who said they definitely would not join subsequently joined. Overall, 14% of the black men, 6.5% of the white men and 6.8% of the Hispanic men in the survey joined the military.

The estimate of high-quality qualified military available interested in joining the service (HQ QMJ) is a multiplicative model. For each race/gender/age market segment, high-quality qualified military available (HQ QMA) in mental categories I-IIIA was estimated. Next, the probability of falling in a particular interest category was estimated. Finally, the probability of joining, given an interest category, was estimated. Therefore, the estimate of HQ QMJ for males 17-21 years old in a county is:

$$HQ\ QMJ = \sum_{m=1}^{3} \sum_{i=2}^{2} \sum_{j=1}^{4} QMA_i^m \times Pr(Interest_j^m | Mental\ Group\ i) \times Pr(Join^m | Interest_j)$$

where

m = white plus other, black, or Hispanic;

i = mental category I & II, mental category IIIA; and

j = definitely interested, probably interested, probably not interested, and definitely not interested.

Thomas and Gorman (1991) point out that there is substantial regional variation in the population proportion that would potentially join the military. To facilitate easy comparison, an index was created for all counties with a HQ QMJ estimate of five or more. The index is the ratio of HQ QMJ to regional HQ QMA standardized with a mean of 100 and a standard deviation of 25.

2. Production-Weighted Qualified Military Available

From 1983 through 1989, the Marine Corps used a method called the Fairshare Quota Distribution to allocate recruiting mission. Recruiting managers at the national level would allocate quotas to the district (regional) level based on the QMA estimate for the region (using the NPRDC model of Curtis, Borack and Wax) as well as estimates of propensity of individuals in that district to enlist. These estimates were

used to apportion the goal to the districts in proportion to the product of the QMA in the district and the relative propensity of individuals in that district to enlist:

$$Quota_i = f(QMA_i)(Propensity_i)$$

where QMA_i is used as the estimate of the high-quality target population[7] in the i^{th} district, and $Propensity_i$ is the ratio of the propensity to enlist in the i^{th} district to the average propensity to enlist in all districts. Although the basic concept seems reasonable, the procedure has several practical limitations.

The propensity index consists of four components:

1) the Youth Attitude Tracking Survey (YATS),
2) the Priority Prospect Card return rate,
3) the unemployment rate, and
4) the recruiter productivity rate.

The major weakness is that the components are generally not available as a function of aptitude scores, therefore reducing the relevance and effectiveness of the components as a measure of propensity.[8]

---

[7]The Marine Corps' "high-quality target population" is defined as male, high school graduates who score in the upper 50th percentile on the AFQT. The Marine Corps uses the estimate of QMA authored by Curtis, Borack, and Wax. The estimate forecasts the number of male, high school graduates who can score in the top half of the AFQT for the local geographic region.

[8]Horne, Hughes, and Sims (1990) and North (1991).

To correct for the problem of applying a propensity measure to the estimated QMA of a geographic region, Horne, Hughes and Sims (1990) developed an estimate of production-weighted qualified military available (PQMA). In Fiscal Year 1991 the Marine Corps adopted the PQMA system as a way of capturing both the geographic distribution of qualified youth and their propensity to join the armed services. The implementation of the PQMA method has meant a dramatic shift away from the old system of allocating recruiting goals based on the Profile of American Youth data set to predict county-level AFQT scores. (North 3)

The basic premise of the estimate is that the combined effort of recruiters from all services over a number of years will produce "high quality" recruits from a locality (county, station, or district) in proportion to the product of high-quality military available in that locality and the local propensity to enlist. It then follows that the product of QMA and propensity can be estimated as proportional to the fraction of all high-quality recruits that come from the locality.

The estimated PQMA for the I^{th} locality in the J^{th} year would be:

$$PQMA_{I,J} = \frac{ENL_{I,JBASE}}{\sum_{I=1}^{N} ENL_{I,JBASE}} \quad CURRENT\ QMA_{USA,J},$$

where JBASE is a particular year or group of years and N is the total number of localities.

The advantages of the PQMA estimate include:

1) Simple to develop,

2) Implicitly reflects local aptitude levels,[9]

3) Implicitly reflects local propensity,

4) Implicitly reflects local moral and physical disqualification rates,

5) Quick to update, assures estimates will track changing conditions, and

6) Inexpensive to iterate to get better estimates.

A drawback to PQMA is that by using data from all the services, the system is insensitive to differences in preferences for individual services across locations. For example, a county with a large Navy base may receive more of its normal share of accessions. However, Horne, Hughes and Sims (1990) point out the characteristic should have only minimal impact since local area commanders take this into account when making assignments.

The issue of race/ethnicity of the potential recruit market is not addressed by the PQMA method. The PQMA estimate for a recruiting region or county is not sub-divided into

[9]Horne, Hughes, and Sims (1990) state that propensity to enlist is a strong function of the aptitude level of an individual. For example, 5 out of every 100 individuals in AFQT category IIIA are enlisted each year. This rate is about 3 times the rate for those in category I.

racial/ethnic groupings. Therefore, the estimate cannot be used for setting recruiting goals by race/ethnic groups.

Another disadvantage of the PQMA method is how the estimate treats recruiting of reservists. Marine recruiters are usually given both an active and reserve duty quota. North (1991) points out that the PQMA estimate assumes recruiting a reservist and an active duty Marine are equally difficult. Reserve recruiting may be easier in certain areas. North's analysis predicts that recruiter productivity will decrease in areas with a large requirement for reserve enlistments. The PQMA model does not accurately reflect the difference between reserve and active duty recruiting and therefore the estimate of PQMA may overstate the number of potential recruits.

Another deficiency of the model is that it is based on historical data. The estimate adjusts according to past enlistments in a locality as a ratio of total enlistments over a specified number of years. Horne, Hughes and Sims analyzed the effectiveness of using one, three and five years of historical data as the base in estimating PQMA. Results show that using one year as the base period was preferred when comparing PQMA estimates to actual accessions for large counties but three year base periods were best for medium and small counties. Regardless of the number of periods in the base, the model is "backward looking." The effects of changes in regional labor markets and other economic trends which

affect local recruiting may not be accurately reflected in PQMA estimates.

Forecasting future changes in the qualified military available population to adjust recruiting facilities (recruiting offices and active duty recruiters) requires the use of a forward-looking model. Although Doll (1992) points out that the traditional manning level of Marine Corps recruiting facilities in an area is usually developed over years of trial and error, applying the PQMA model to future estimates of the total qualified military available population will not account for demographic changes in the military available population.

III. METHODOLOGY AND DATA

A. THEORETICAL FRAMEWORK

The military targets recruiting male high school graduates, 17-to-21 years of age who score in the upper 50th percentile on the Armed Forces Qualification Test (AFQT), referred to as the "qualified military available" (QMA) market. In order to set recruiting quotas by geographic region and allocate recruiting resources efficiently, the services rely on estimates of the local population who meet the above criteria.

This thesis compares two market potential estimates of the qualified military available population. Estimates were calculated for each county in the continental United State for 1990 using a mainframe computer statistical analysis software package. Counties were then divided into five groups by the number of quality Marine Corps accessions. Estimates of recruit market potential were then compared within each group both against each other and actual 1990 accessions. Regression and correlation analyses were used to determine the relationship between each set of estimates and actual accession data. Regions with low correlation between estimated market and actual accessions were identified and analyzed for potential causes of differences. Particular

attention was paid to whether the estimates accounted adequately for differences in qualification for military service by both race/ethnic group and region.

Comparisons were be made using active duty enlistments from all four services. A separate set of comparisons was generated using accessions data from only the Marine Corps. Bicaksiz (1992) found the Marine Corps to be the most efficient service in terms of market potential utilization. Differences between the two sets of comparisons were identified and analyzed.

Recent world events such as Operation Desert Shield/Storm and the downsizing of the military due to the end of the cold war may have affected the propensity of qualified individuals to enlist in the military. The military involvement in the Persian Gulf, reports of base closures and personnel cuts, and less military advertising have made it more difficult to interest young people in enlisting in 1991 and 1992.[10] To eliminate the possible impact of these events on enlistments, market potential e. timates and actual accessions for 1990 were used in this study.

Counties were grouped according to the number of high-quality (high school graduate scoring in the upper 50th percentile on the AFQT) males enlisting in the Marine Corps

---

[10]Christopher Jehn, Assistant Secretary of Defense for Force Management and Personnel said, "recruiters report that a lot of young people are surprised to hear we're still recruiting." Navy Times, 12 October 1992.

during 1990. Grouping counties by quality Marine accessions served several purposes. First, since Bicaksiz (1992) found the Marine Corps best utilizes market potential with its recruiting practices, basing the grouping by quality Marine Corps enlistments in 1990 rather than by all services enlistments improves the chances a county's recruit market potential was maximized. Second, grouping counties by number of accessions limits the bias which may affect the results if counties that provide only a small number of accessions are analyzed with large counties that provide hundreds of accessions to the armed services. Lastly, grouping counties by number of quality accessions allowed this study to focus on only those markets which provide the majority of accessions to the armed services.

Table 5 shows that only 2,227 of the 3,074 counties provided a high-quality Marine enlistee in 1990. The table also shows that 5 percent of the counties (having 21 or more quality accessions) accounted for about 48 percent of the total number of quality Marine Corps accessions in 1990. Conversely, about 86 percent of the counties provided nine or fewer quality accessions to the Marine Corps.

Using the information contained in Table 5, counties were grouped based on the number of active duty Marine Corps accessions in 1990 who were 17-to-21 year old, high school graduates, and scored in the upper 50th percentile on the AFQT. Table 6 displays the county groupings and the number of

TABLE 5. NUMBER OF ACTIVE DUTY MALE 17 TO 21 YEAR OLD HIGH SCHOOL GRADUATE MARINE CORPS QUALITY ACCESSIONS BY COUNTY, 1990

ACCESSIONS PER COUNTY	COUNTIES (% TOTAL)	CUMULATIVE COUNTIES (%)	ACCESSIONS (% TOTAL)	CUMULATIVE ACCESSIONS (%)
0	847 (27.6)	847 (27.6)	0 (0)	0 (0)
1 TO 9	1802 (58.6)	2649 (86.2)	5307 (29.4)	5307 (29.4)
10 TO 15	154 (5.0)	2803 (91.2)	1873 (10.4)	7180 (39.8)
16 TO 20	75 (2.4)	2878 (93.6)	1328 (7.4)	8508 (47.2)
21 TO 25	44 (1.4)	2922 (95.0)	1032 (5.7)	9540 (52.9)
26 TO 30	35 (1.1)	2957 (96.2)	971 (5.4)	10511 (58.3)
31 TO 35	15 (.004)	2972 (96.7)	498 (2.8)	11009 (61.1)
36 TO 40	23 (.007)	2995 (97.4)	868 (4.8)	11877 (65.9)
41 TO 45	15 (.005)	3010 (97.9)	640 (3.5)	12517 (69.4)
46 TO 50	15 (.003)	3025 (98.4)	719 (4.0)	13236 (73.4)
51 TO 55	3 (.002)	3028 (98.5)	161 (.009)	13397 (74.3)
56 TO 60	9 (.002)	3037 (98.8)	527 (2.9)	13924 (77.2)
61 TO 65	5 (.002)	3042 (99.0)	316 (1.8)	14240 (79.0)
66 TO 70	5 (.002)	3047 (99.1)	341 (1.9)	14581 (80.9)
71 TO 75	5 (.002)	3052 (99.3)	360 (2.0)	14941 (82.9)
76 TO 80	2 (.001)	3054 (99.3)	159 (.009)	15100 (83.8)
81 TO 85	5 (.002)	3059 (99.5)	418 (2.3)	15518 (86.1)
85 TO 90	3 (.002)	3062 (99.6)	263 (1.5)	15781 (87.6)
90 TO 130	4 (.001)	3066 (99.7)	408 (2.2)	15970 (88.6)
131 OR MORE	8 (.003)	3074 (100)	1833 (10.2)	18022 (100)
TOTAL	3074 (100)	3074 (100)	18022 (100)	18022 (100)

Source: 1990 Active Duty Military Inventory Master File provided by the Defense Manpower Data Center.

counties within each group. Counties were grouped based solely on the number of quality Marine Corps accessions; no effort was made to introduce county characteristics in the

TABLE 6. COUNTY GROUPINGS BY ACTIVE DUTY, 17 TO 21 YEAR OLD, HIGH SCHOOL GRADUATE MARINE CORPS QUALITY ACCESSIONS, 1990

GROUP	ACCESSIONS PER COUNTY	COUNTIES (% TOTAL)	QUALITY ACCESSIONS (% TOTAL)
VERY SMALL	0 TO 9	2649 (86.2)	5307 (29.4)
SMALL	10 TO 25	273 (8.9)	4233 (23.5)
MEDIUM	26 TO 50	103 (3.4)	3696 (20.5)
LARGE	51 TO 130	41 (1.3)	2953 (16.4)
SUPER	MORE THAN 130	8 (.003)	1833 (10.2)
TOTAL		3074 (100)	18022 (100)

Source: 1990 Active Duty Military Inventory Master File provided by the Defense Manpower Data Center.

grouping process. Table 7 displays the number of accessions by all services by county grouping. Future research on market potential and analysis may want to explore county groupings by characteristics such as population, economic status, and level of education.

The primary focus of this study was the "small," "medium" and "large" county groups. Although the "very small" group contains 2649 (86.2 percent) counties, 847 (27.6 percent) had no quality Marine Corps accessions in 1990. The 1802 (58.6 percent) of counties in the "very small" group that did have quality accessions in 1990 accounted for only 29.4 percent of total accessions, and therefore are not the primary focus of the military's recruiting efforts. If the services' size and accession requirements are reduced over the next decade, these

TABLE 7. ALL SERVICES' HIGH-QUALITY 17-TO-21 YEAR OLD MALE ACCESSIONS BY COUNTY GROUP, 1990

GROUP	COUNTIES (% TOTAL)	QUALITY MARINE ACCESSIONS (% TOTAL)	QUALITY ALL SERVICES ACCESSIONS (% TOTAL)
VERY SMALL	2649 (86.2)	5307 (29.4)	40138 (37.3)
SMALL	273 (8.9)	4233 (23.5)	23540 (21.9)
MEDIUM	103 (3.4)	3696 (20.5)	19096 (17.7)
LARGE	41 (1.3)	2953 (16.4)	15584 (14.5)
SUPER	8 (.003)	1833 (10.2)	9309 (8.6)
TOTAL	3074 (100)	18022 (100)	107667 (100)

Source: 1990 Active Duty Military Inventory Master File provided by the Defense Manpower Data Center.

counties are highly likely targets for reduced recruiting resources. Accordingly, the "very small" group was not analyzed in this study. The "super" group contains eight counties (.003 percent) that provide 10.2 percent of the total high-quality Marine Corps accessions. Table 8 displays the counties in the "super" group and the number of high-quality Marine Corps accessions in 1990. The range of actual quality accessions is quite broad and the characteristics of the counties very different. Therefore, while this group was included in the comparison, no effort was made to analyze the results for these counties as a group.

TABLE 8. COUNTIES IN THE "SUPER" GROUP AND NUMBER OF HIGH-QUALITY MARINE CORPS ACCESSIONS, 1990

COUNTY	HIGH-QUALITY ACCESSIONS
LOS ANGELES, CA	408
COOK, IL	365
MARICOPA, AZ	221
HARRIS, TX	215
WAYNE, MI	194
SAN DIEGO, CA	163
DALLAS, TX	137
BEXAR, TX	130

Source: 1990 Active Duty Military Inventory Master File provided by the Defense Manpower Data Center.

B. MARKET ESTIMATES

This study compares two recruit market potential estimates: Production Weighted Quality Military Available (PQMA) and High Quality Military Available and Interested (HQ QMJ). Other measures of recruit market potential such as those used by the Army and Air Force were considered for inclusion but adequate information about them was not available from the originating agencies within the time horizon of this thesis. Chapter II, Section F contains a detailed discussion of the estimates used in the study.

1. Production Weighted Qualified Military Available

The Production Weighted Qualified Military Available (PQMA) method estimates recruit market potential at the county

level based on past accessions from the county and the current estimate of the qualified military available population. The basic premise of the method is that a geographic region should continue to provide the same percentage of total quality accessions as it has in the past. Therefore, the county's proportion of past total quality accessions is applied to the current estimate of the qualified military available population. The PQMA method uses the Naval Personnel Research and Development Center's estimate of the current qualified military available population.

The Marine Corps does not currently use the PQMA method to forecast the qualified military available population at the local level by race/ethnic group. For this study, PQMA estimates were be generated by race/ethnic group to allow more detailed comparison to the HQ QMJ forecasts and to study the effects of race/ethnic group and geographic region on qualification for military service.

Two observations from the "small" group were not included in this study. Because PQMA uses the number of past accessions in a local area to determine recruit market potential, if a county did not yield any high-quality accessions in the base year, PQMA for that county is zero. In two cases, the number of quality accessions in the base year (1988) used to estimate PQMA for 1990 was zero, yielding a PQMA estimate of zero. These observations were dropped from the data set.

2. High Quality Military Available and Interested

The High Quality Military Available and Interested estimate of recruit market potential uses Woods & Poole population estimates and the Profile of American Youth data set to forecast the number of 17-to-21 year old males scoring in the upper 50th percentile of the Armed Forces Qualification Test (AFQT). Forecasts are made at the local (county) level based on the demographic characteristics of the county. A measure of the propensity to enlist by race/ethnic group, AFQT mental category, and economic status is then applied to the forecast of the qualified military available population to estimate the number of high quality individuals interested in joining the military.

Measures of the propensity to enlist used in estimating HQ QMJ in this study do not include an adjustment for economic status (poverty or not in poverty). The number of observations in the Profile of American Youth data set in each race/ethnic category grouped by mental category and poverty status who enlisted in the military is too small for the resulting measure of propensity to be reliable. Therefore, no grouping of actual accessions by economic status was made.

The propensity to enlist by race/ethnic group and AFQT mental category has been adjusted. Table 9 displays the numbers and percentages of individuals who enlisted in the military by race/ethnic group and AFQT score from the Profile

of American Youth data set. Note the small number of observations in some AFQT categories for minority racial groups. Because of the small number of observations, the following changes have been made to the measure of propensity in estimating HQ QMJ:

1) White AFQT CAT I and CAT II who joined the military have been combined to produce one measure of propensity to enlist for these groups (8.23 percent),

2) Black enlistments have been combined to produce only one measure of propensity to enlist for AFQT Categories I-IIIA (19.34 percent), and

3) The propensity to enlist used for Hispanics is the same as that used for whites (8.23 percent for AFQT CAT I and CAT II, 12.13 percent for AFQT CAT IIIA). Since the number of observations in this race/ethnic group is so small, it is difficult to make any inferences about the propensity to enlist.

C. DATA

1. Population Estimates

Population estimates used to estimate the High-Quality Military Available and Interested (HQ QMJ) are provided by Woods & Poole Economics, Inc. Separate estimates are made for each county for men and women age 17-to-21 subdivided by race/ethnic group (white, black and Hispanic). The population serving in the military, the institutional population (in prison, under permanent health care, etc.) and those who were not high school graduates were subtracted from the 17-to-21 year old population estimates to obtain the military

TABLE 9. ENLISTMENTS BY RACE/ETHNIC AND MENTAL GROUP, PROFILE OF AMERICAN YOUTH DATA SET

RACE/MENTAL GROUP		ENLISTED (%)	NOT ENLISTED (%)	TOTAL
WHITE	AFQT CAT I	14 (8.05)	160 (91.95)	174
	AFQT CAT II	44 (8.29)	487 (91.71)	531
	AFQT CAT IIIA	29 (12.13)	210 (87.87)	239
	TOTAL	87 (9.22)	857 (90.78)	944
BLACK	AFQT CAT I	0 (0)	4 (100)	4
	AFQT CAT II	11 (24.44)	34 (75.56)	45
	AFQT CAT IIIA	8 (16.33)	41 (83.67)	49
	TOTAL	19 (19.39)	79 (80.61)	98
HISPANIC	AFQT CAT I	0 (0)	6 (100)	6
	AFQT CAT II	2 (3.85)	50 (96.15)	52
	AFQT CAT IIIA	1 (2.70)	36 (97.30)	37
	TOTAL	3 (3.16)	92 (96.84)	95

Source: Profile of American Youth data set.

available population. (Thomas and Gorman, 1991 and Bicaksiz, 1992)

The Woods & Poole Economics, Inc. database contains over 300 economic and demographic variables for every county in the United States for every year 1969 through 2010. The primary method used to generate the complete county forecasts proceeds in three stages. First, the country is divided into 183 Economic Areas (EAs) as defined by the U.S. Department of Commerce, Bureau of Economic Analysis. For each EA a forecast

is made for employment using an "export-base" approach. Certain industrial sectors at the regional level are considered "basic." This means that these sectors produce output that is not consumed locally but is produced for export out of the region for national or international consumption. The employment forecast for each EA is then used to estimate earnings in each EA.

The second stage of the forecast procedure is to make population by age, sex and race/ethnic group forecasts on the basis of net migration rates projected from employment opportunities. The third stage is a replication of the first two stages except that it is performed at the county level using the EAs as the control total for the county forecast.

High school graduation rate data from the 1980 U.S. Census are applied to the forecasts to estimate the number of 17-to-21 year old high school graduates at the county level. The forecasts are then disaggregated to contain estimates of the 17-to-21 year old population for each county by race/ethnic group and gender.[11]

The Production-Weighted Qualified Military Available method requires an estimate of the current qualified military available (QMA) population. The Marine Corps uses the QMA estimate developed by Curtis, Borack, and Wax (1987). The QMA

[11]Information on the Woods & Poole Economics, Inc. forecasting procedure provided by "County Population Age 17-21 and 22-29 By Race and Sex Magnetic Tape Technical Documentation," Woods & Poole Economics, Inc, 1987.

estimate originates with the U.S. Bureau of the Census forecasts of 17-21 year old males residing in the United States. Forecasts are based on the 1980 Census files, principally the 5 percent "Public Use Micro Sample" (PUMS), that have been updated annually. Bureau of the Census projections were used to correct for migration and immigration changes in the forecast of the 17-21 year old male population (Curtis, Borack, and Wax, 1987).

Table 10 displays the QMA estimate by race/ethnic group for the United States used to calculate Production-Weighted Military Available for 1990 at the county level.

TABLE 10. ESTIMATES OF QUALIFIED MILITARY AVAILABLE (QMA) POPULATION BY RACE/ETHNIC GROUP, 1990

BLACK	99,922
HISPANIC	158,157
WHITE/OTHER	2,344,533
TOTAL	2,602,612

Source: Curtis, Borack and Wax (1987).

2. Actual Accessions

The 1990 Active Duty Military Inventory Master File was provided by the Defense Manpower Data Center (DMDC). This file contains a myriad of personal information for all those who enlisted during 1990. Data fields used in this study include information concerning each enlistee's gender,

race/ethnic group, age, residence, education status, Armed Forces Vocational Aptitude Battery (ASVAB) subtest scores and branch of service.

The 1988 Active Duty Military Inventory Master File was also provided by DMDC to generate Production-Weighted Qualified Military Available estimates for 1990 (See Chapter II, Section E, part 2 for discussion on estimating PQMA).

Figures 3 and 4 display the percentage of recruits by service in 1988 and 1990, respectively, who are high school graduates and scored in mental group categories I-IIIA. In each year, the Air Force had a substantially higher percentage of these recruits than any of the other services. This can be attributed in part to the minimum required AFQT score required for enlistment in the Air Force (See Chapter 2, Section E, part 2). The Marine Corps had the second highest percentage in each of these years, but the Army was only one percentage point lower in fiscal year 1990. Note that the Navy is closing the gap. Thus, while there have been some historical differences between the services, all appear to be pursuing quality contracts. (North, 1991)

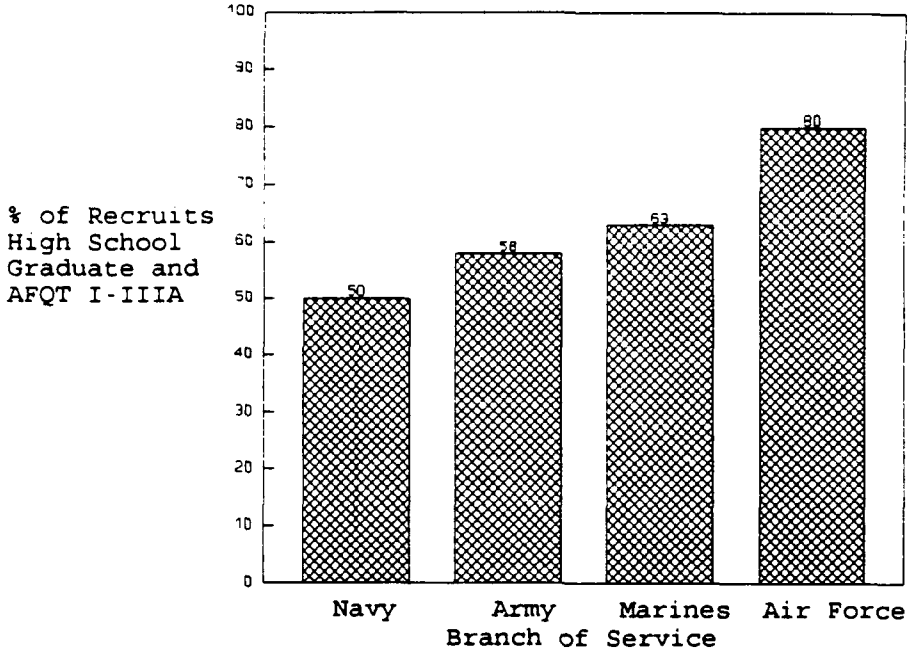

Figure 3. Quality Male Recruits in FY 1988

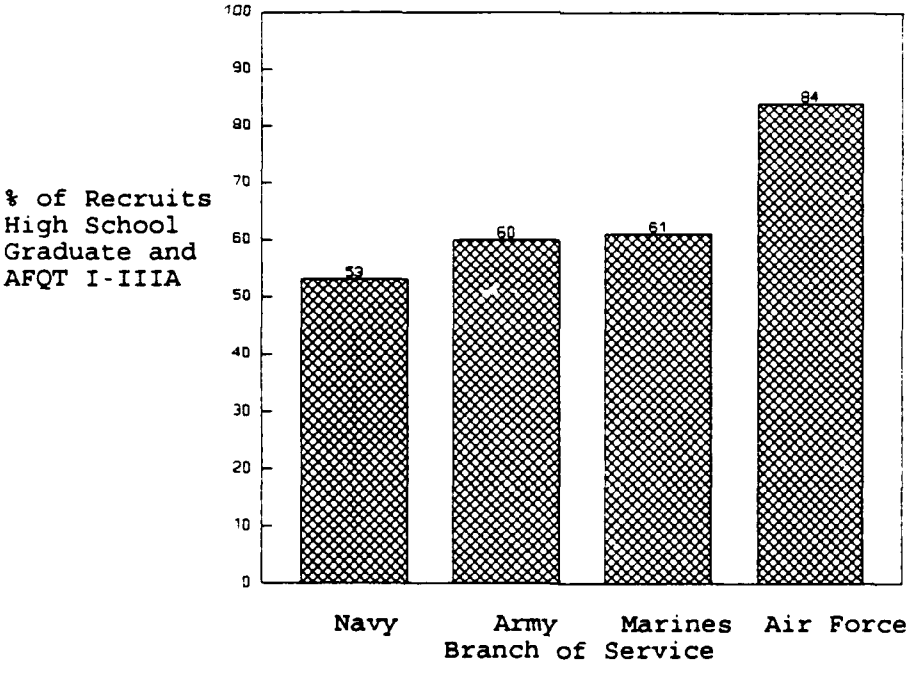

Figure 4. Quality Male Recruits in FY 1990

Source: Both Figures 3 and 4 from North, 1991

3. Profile of American Youth

The Profile of American Youth is an extension of the National Longitudinal Surveys of Labor Market experience initiated by the Office of Manpower Policy, Evaluation and Research of the United States Department of Labor in the mid-1960's. In 1979 a national probability sample was drawn to take part in the survey. The sample consisted of three groups: (1) a cross-section of American youth 14 to 21 years old as of 1 January 1979 in their proper population proportions; (2) a supplemental oversample of civilian Hispanic, black, and economically disadvantaged whites[12] in the same age range; and (3) a military sample of individuals 17 to 21 year old who were serving in the military as of 30 September 1978. The Armed Services Vocational Aptitude Battery (ASVAB) was administered to NLSY respondents in 1980. Of the original 12,686 NLSY respondents, 11,914 took the ASVAB (Moreau, 1992).

The High-Quality Qualified Military Available and Interested estimate uses the Profile of American Youth data set of the National Longitudinal Survey of Youth (NLSY) as one element in estimating the number of people in each AFQT mental category at the county level. County level AFQT distributions were developed by combining information on the racial/ethnic mix at the local level from Woods & Poole and regression

[12]In the NLSY, "white" refers to all non-black, non-Hispanic individuals.

results obtained from relating respondent data from the NLSY Profile of American Youth to AFQT score. Regression equations were developed from the NLSY to estimate the probability that a 17 to 21 year old high school graduate will score in the upper 50th percentile on the AFQT. The probability is modeled as a function of socioeconomic variables including age, gender, race/ethnicity, parents' education, and poverty status. (Thomas and Gorman, 1991 and Moreau, 1992).

D. REGRESSION MODELS

A bivariate regression model was used to generate the correlation coefficients between actual quality accessions and each estimate of recruit market potential for each county group. The simple linear regression model is:

$$Y_i = \alpha + \beta X_i + e_i$$

where Y_i is quality accessions for county i, X_i is a measure of the recruit market potential for county i, alpha and beta are parameters, and e is a random error term. A separate regression model was used to generate the correlation coefficients between actual quality Marine Corps accessions and each estimate of recruit market potential for each county group.

The regression R-squared, which represents the proportion of variation in the dependent variable which is explained by the regression equation, was used as a measure of the

goodness-of-fit between actual accessions and estimated market potential. The regression R-squared is also the square of the correlation coefficient between X and Y in the simple bivariate regression model (Pindyck and Rubinfeld, 1991). The coefficient of correlation between actual accessions and estimated recruit market potential is expected to be positive but less than one.

To lend additional insight into PQMA and HQ QMJ as estimates of recruit market potential, a multivariate regression model was used to analyze the relationship between actual accessions, market potential, region, market size, and a proxy variable to represent income and education status at the county level. The multivariate regression model is:

$$Y_i = \beta_0 + \beta_1 X_{1i} + \beta_2 X_{2i} + \beta_3 X_{3i} + e_i$$

where Y_i is quality accessions for county i, X_1 is a measure of estimated recruit market potential for county i, X_2 represents a set of dummy variables for region, X_3 represents a proxy variable for county nonwhite population percentage, betas represent parameter estimates for the intercept and variables X_1 to X_3, and e is a random error term (Pindyck and Rubinfeld, 1991). If an estimate of QMA has captured the effect of region and socioeconomic status on recruit market potential, the parameter estimates of region and the proxy variable for socioeconomic status (county nonwhite population

percentage) are not expected to be statistically significant in the multivariate model.

Several unsuccessful attempts were made to include an independent variable to represent market size in the multivariate regression model. However, specification problems arose, since market size can be considered a proxy for accessions: larger markets generally account for more accessions than smaller markets. Other variables that may have been important in modeling percent deviation of actual accessions from estimated market, such as local unemployment rates and percent of high school graduates entering post-secondary education, were not available nor within the scope of this research.

IV. RESULTS AND ANALYSIS

Using a mainframe statistical software package, estimates of local recruit market potential were calculated using both the Production-Weighted Qualified Military Available (PQMA) and the High-Quality Qualified Military Available and Interested (HQ QMJ) method for each county in the continental United States. Counties were then grouped according to the number of quality Marine Corps accessions in 1990. Regression and correlation analysis was used to explore the relationship between actual quality accessions from all services and estimated market potential within each county group by race/ethnicity and by region. A separate set of regression equations was used to explore the relationship between quality Marine Corps accessions and estimated market potential. Finally, regression analysis was also used to examine the relationship between the PQMA and HQ QMJ results.

A. PQMA RESULTS

A simple linear regression model was used with actual quality accessions as the dependent variable and the PQMA estimate of recruit market potential as the independent variable for each county grouping. Separate regressions by race/ethnicity were conducted to explore the ability of the PQMA method to estimate recruit market potential for

race/ethnic groups. Table 11 indicates the county group and the regression R-squared (R^2) which is a measure of the goodness of fit for the bivariate model. The results indicate that there was a strong correlation[13] between PQMA estimates of market potential and actual accessions from all services.

TABLE 11. REGRESSION R-SQUARED BETWEEN 1990 ALL SERVICES AND MARINE CORPS ACTUAL QUALITY ACCESSIONS AND PQMA ESTIMATES BY COUNTY AND RACE/ETHNIC GROUP

COUNTY GROUP	R-SQUARED OF REGRESSION FOR TOTAL/WHITE/BLACK/HISPANIC	
	ALL SERVICES	ONLY MARINE CORPS
SMALL	.797/.807/.866/.368	.305/.338/.647/.241
MEDIUM	.787/.738/.918/.348	.254/.301/.708/.279
LARGE	.750/.835/.943/.286	.369/.457/.860/.358
SUPER	.950/.791/.963/.654	.821/.422/.853/.820

Source: Analysis of data provided by DMDC and NPRDC.

Note: Parameter estimates significant at the .01 level.

1. All Services

Table 11 also indicates that, for each county group, the relationship between PQMA estimates of market potential and actual Marine Corps accessions was not as strong as was the relationship between PQMA estimates and accessions from all services. This is an expected result since the PQMA method does not differentiate between services when estimating recruit market potential. The PQMA method estimates the

[13]The R-squared of regression is the square of the correlation coefficient between two variables in a bivariate (simple) regression model.

qualified military available population interested in joining any of the services, not just the Marine Corps.[14]

From Table 11, discounting the results of the super county group because of the small number of observations, the relationship between total accessions for all services and estimated market potential was strongest in the small county group (.797), followed by the medium county group (.787). The relationship between total black accessions and estimated market for blacks was generally stronger than that of whites. The relationship between actual Hispanic accessions and estimated market for Hispanics was generally much weaker than that of the white and black groups.

Between county groups, R^2 was slightly higher for the small county group (.797) than for the large county group (.750), indicating that the relationship between total actual accessions and estimated market was slightly stronger in the small county group than in the large county group. This may signify that the services did not fully utilize the market potential of the large county group. Alternatively, this may indicate that the propensity to enlist in the services is greater in the counties which make up the small group than in the counties that make up the large group. Bicaksiz's (1992) findings were similar. He found that the top 100 counties in terms of the military available (male high school graduate,

[14]See Chapter II, Section F for a complete discussion of the PQMA estimation procedure.

17-to-21 years old) contained 45.7 percent of the military available population while only 33 percent of actual accessions came from these counties.

2. Marine Corps

The relationship between estimated market and quality Marine Corps accessions was strongest in the large county group (.369), followed by the small county group (.305). The strength of the relationship between actual Marine Corps accessions and estimated market potential by race generally followed the same pattern as that of the relationship between total service accessions and estimated market: the relationship was strongest for the black group, followed by the white and Hispanic groups. However, note that, given the R^2 of total Marine Corps accessions to estimated market potential, the R^2 results for black and Hispanic Marine Corps accessions were comparatively larger than the results of all services' accessions and estimated market.

Several factors may have contributed to the differences in the regression results between 1990 all service and Marine Corps quality accessions and estimated market potential. First, because of the difference in the number of recruits enlisted each year by service, the total number of accessions are driven by the Army and Navy's demand for enlistees. For example, in 1990 the Marine Corps had approximately 10.5 percent of all-service quality accessions.

Therefore, because the Army and Navy, and to a lesser extent the Air Force, enlist so many more individuals, differences in the regression results between all service and Marine Corps quality accessions and estimated market potential should be expected. Second, counties within a group that are good branch-specific markets may have caused differences in the results. For example, a county with a large Army or Navy base, or a county with a large Army or Navy Junior ROTC contingent in the high schools may provide those services with a proportionally large number of recruits, and therefore the regression results between all services and Marine Corps quality accessions and estimated market potential may be different.

3. Market Utilization

To investigate further how market utilization varied across county and race/ethnic groupings, an index of market potential utilization (IMPU) was constructed. For each county, the ratio of actual quality accessions to estimated market potential in the county was compared to the ratio of total quality accessions to total estimated market potential for the counties in the small, medium, large and super groups. The index was then standardized to a mean value of 100 and a standard deviation of 25 to allow for easy comparison. A value over 100 indicates that the actual quality accessions relative to the estimated QMA market in the county was greater

than the national average of the ratio of actual accessions to the estimated QMA market. The index was also constructed to facilitate comparisons of market utilization by race/ethnic group. Thus, the index of market potential utilization was:

$$IMPU_{ab} = 100 \times \left[\frac{QMA\ ACCESSIONS_{ab}}{ESTIMATED\ QMA_{ab}} \div \frac{TOTAL\ QMA\ ACCESSIONS_{b}}{TOTAL\ ESTIMATED\ QMA_{b}}\right];$$

where *a* is the county and *b* the population segment (total, white, black, or Hispanic). Table 12 displays the mean index values for each county group.

TABLE 12. STANDARDIZED MEAN INDEX OF MARKET POTENTIAL UTILIZATION BY COUNTY GROUP, PQMA METHOD

COUNTY GROUP	MEAN IMPU	STANDARD DEVIATION	IMPU RANGE	
			GROUP LOW	GROUP HIGH
SMALL	99.12	28.13	48.93	279.38
MEDIUM	102.35	18.67	68.17	160.84
LARGE	99.29	17.75	68.49	145.17
SUPER	106.00	12.51	90.38	127.74

Source: Analysis of data provided by DMDC and NPRDC.

Note: IMPU is standardized to a mean of 100 and a standard deviation of 25.

The results of Table 12 show that the mean index values of the small and large county groups were similar, indicating that local market draw relative to the PQMA estimate of market potential was not necessarily a function of

market size among the small, medium, large and super county groups. However, market utilization within county groups varied substantially. The small county group IMPU had a much larger standard deviation (28.13) and a much broader range of values (48.93 to 279.38) than the other groups. The medium and large groups had similar standard deviations (18.67 and 17.75, respectively) but the range of IMPU values in the medium county group was broader (68.17 to 160.84) than in the large county group (68.49 to 145.17). Because of the differences in the standard deviation and range of values of the IMPU by county group, inferences about the propensity to enlist by market size should not be based solely on county group averages. Variables other than market size which may affect the decision to enlist, such as qualification for military service and the intensity of the recruiting effort at the local level should be taken into account.

4. Regional Differences in PQMA Results

To determine if the relationship between actual accessions and estimated market potential differs across regions of the United States, the counties in each group were divided into four regions corresponding with the U.S. Bureau of the Census regional grouping.[15] Because of the small

[15]West Region: WA, OR, CA, NV, ID, MT, WY, CO, UT, AZ, NM.
North Central Region: ND, SD, NE, KS, MN, IA, MO, WI, IL, IN, MI, OH.
Northeast Region: PA, NY, VT, ME, NH, MA, CT, RI, NJ.
South Region: TX, OK, AR, LA, KY, TN, MS, AL, WV, VA, MD, NC, SC, GA, FL,

number of observations by region in the large and super group counties, the analysis of the regional differences between actual accessions and estimated market potential was limited to the small and medium county groups. Table 13 displays the number of observations and the regression R^2 results by region for the small and medium county groups.

TABLE 13. REGRESSION R-SQUARED BETWEEN 1990 ALL SERVICES AND MARINE CORPS ACTUAL QUALITY ACCESSIONS AND PQMA ESTIMATES BY COUNTY, REGION AND RACE/ETHNIC GROUP

COUNTY GROUP/REGION	R-SQUARED OF REGRESSION FOR TOTAL/WHITE/BLACK/HISPANIC	
	ALL SERVICES	ONLY MARINE CORPS
SMALL	TOT/WHT/BLK/HISP	TOT/WHT/BLK/HISP
NORTHEAST (n=58)	.784/.791/.940/.874	.308/.319/.806/.716
NORTH CENTRAL (n=79)	.790/.777/.744/.087	.384/.313/.506/.172
SOUTH (n=104)	.860/.841/.839/.322	.231/.250/.572/.243
WEST (n=30)	.832/.854/.855/.215	.285/.308/.090/.114
MEDIUM		
NORTHEAST (n=28)	.708/.767/.864/.896	.288/.434/.511/.706
NORTH CENTRAL (n=17)	.921/.910/.865/.499	.461/.533/.354/.335
SOUTH (n=36)	.784/.587/.935/.624	.118/.325/.741/.640
WEST (n=22)	.745/.779/.751/.208	.308/.164/.626/.283

Source: Analysis of data provided by DMDC and NPRDC.

Note: Parameter estimates significant at the .05 level.

DE, and District of Columbia.

a. All Services

Table 13 shows that the correlation between total accessions for all services and PQMA estimated market potential is relatively consistent across regions for the small and medium county groups. The regions with outlying R^2 are the South (.860) in the small county group and the Northeast (.708) and the North Central (.921) in the medium county group. However, the results may be biased due to the small number of observations (n=28 and 17, respectively) of these latter regions within the medium county group.

The R^2 of regression results by region and race/ethnic group in Table 13 shows that the relationship between total actual accessions and estimated market potential by race/ethnic group varied by region. Note that the R^2 results for all service accessions for the white and black race/ethnic groups were more consistent than the Hispanic market segment across region and county groups. The results for the Hispanic race/ethnic group ranged from .087 to .896.

b. Marine Corps

The R^2 of regression results between total actual Marine Corps accessions and PQMA estimated market potential were relatively consistent across regions for the small and medium county groups. As with the regression results between total actual accessions and PQMA estimated market, in the medium county group the North Central region (.461)

demonstrated a generally stronger relationship than the other regions. But as discussed previously, the results may be biased due to the small number of observations (n=17).

An unexpected result was the comparatively weak relationship between Marine Corps accessions and estimated market for the South region (R^2=.118) in both the small and medium county groups. Whereas the South region demonstrated a comparatively strong relationship between all service accessions and estimated market, the relationship between Marine Corps accessions and estimated market for the South region was the weakest in both the small and medium county groups.

Substantial variation by race/ethnic group was found between Marine Corps accessions and PQMA estimated market potential by region. The relationship between white Marine Corps accessions and estimated market potential was relatively consistent by region, with the only outlier being the West (R^2=.164) in the medium county group. However, results for the black and Hispanic groups varied substantially by region. The regression results for the black group were generally much stronger than those of the white group, with the exception of the West region in the small county group (R^2=.090). Similar to the relationship between total Hispanic accessions and estimated Hispanic market potential, the regression R^2 results of only Marine Corps accessions to PQMA

estimated market potential also indicated a large range for the Hispanic race/ethnic group (.1135 to .7158).

Several factors may have contributed to the broad variation in the relationship between Hispanic accessions and estimated Hispanic market potential. An analysis of the R^2 of regression of actual Hispanic accessions and estimated Hispanic market potential for the North Central region (R^2=.087) in the small county group showed that of the 79 observations in this group, 58 had zero or one quality Hispanic accessions in 1990. Because this region consists of many rural counties with small Hispanic populations and several large metropolitan areas with a Hispanic population representative of the national average, the usefulness of a regression model is limited due to the large deviations of the predicted values of total quality Hispanic accessions from the mean value of PQMA for the Hispanic population segment in this region.

A number of other factors may have contributed to the inconsistent results for the Hispanic race/ethnic group. The PQMA estimate of recruit market potential is based on the U.S. Bureau of the Census estimates of population and the relationship between mental aptitude and background characteristics as captured by the 1980 Profile of American Youth data set of the NLSY. According to Curtis, Borack and Wax (1987), U.S. Bureau of the Census population estimates are not mutually exclusive by race/ethnic group since the white

population estimate contains Hispanics, as does the black race/ethnic group. Also, although an effort was made to oversample for Hispanics, blacks, and economically disadvantaged whites in the NLSY, the number of Hispanics in the sample may not be large enough to make inferences about the Hispanic population meeting the mental qualifications for military service. And because the county estimates are based on population proportions given county characteristics from the NLSY (1980), immigration trends since that time may not be reflected in the PQMA estimates. Therefore, the inputs to the PQMA estimating procedure may not be representative of the 1990 Hispanic population segment and the likelihood of misestimating is increased.[16]

5. Regional Differences in Market Utilization

To provide further insight into the relationship between actual accessions and PQMA estimated market potential, an index of market potential utilization by region and race/ethnicity was constructed. Table 14 displays the IMPU results for the small county group by region and race/ethnic group. Table 15 displays the IMPU results for the medium county group.

[16]Curtis, Borack and Wax (1987) note that an adjustment was made to population estimates to correct only for the small proportion of Hispanics also classified as blacks.

TABLE 14. INDEX OF MARKET POTENTIAL UTILIZATION BY RACE/ETHNIC GROUP AND REGION, PQMA ESTIMATES, SMALL COUNTY GROUP

REGION/ RACE/ETHNIC GROUP	MEAN IMPU	STANDARD DEVIATION	IMPU RANGE	
			REGION LOW	REGION HIGH
NORTHEAST				
TOTAL	90.79	24.43	51.02	166.14
WHITE	95.00	22.37	58.89	161.04
BLACK	90.33	17.79	75.55	154.13
HISPANIC	92.10	9.12	87.40	133.16
NORTH CENTRAL				
TOTAL	90.22	21.20	48.93	137.55
WHITE	93.04	18.96	56.36	135.39
BLACK	96.40	32.92	75.55	258.90
HISPANIC	92.79	10.87	87.40	144.60
SOUTH				
TOTAL	111.99	31.18	63.42	279.37
WHITE	109.81	32.28	3.62	261.04
BLACK	108.67	31.63	75.55	285.09
HISPANIC	95.97	14.57	87.40	149.69
WEST				
TOTAL	94.07	23.63	50.92	146.79
WHITE	99.12	21.50	61.67	154.09
BLACK	84.97	15.77	75.55	127.94
HISPANIC	105.13	21.16	87.40	178.92

Source: Analysis of data provided by DMDC and NPRDC.

Note: IMPU is standardized to a mean of 100 and a standard deviation of 25. Values of 75.55 for the black race/ethnic group and 87.40 for the Hispanic race/ethnic group indicate no quality blacks or Hispanics, respectively, were accessed in a county belonging to the corresponding region.

TABLE 15. INDEX OF MARKET POTENTIAL UTILIZATION BY RACE/ETHNIC GROUP AND REGION, PQMA ESTIMATES, MEDIUM COUNTY GROUP

REGION/ RACE/ETHNIC GROUP	MEAN IMPU	STANDARD DEVIATION	IMPU RANGE	
			REGION LOW	REGION HIGH
NORTHEAST				
TOTAL	104.38	18.16	75.22	160.84
WHITE	108.81	18.27	75.46	152.70
BLACK	99.93	11.81	75.55	127.94
HISPANIC	98.34	11.69	87.40	144.61
NORTH CENTRAL				
TOTAL	96.71	18.14	70.11	142.18
WHITE	100.55	17.83	77.49	147.52
BLACK	99.84	6.39	91.03	112.22
HISPANIC	96.78	8.09	87.40	116.00
SOUTH				
TOTAL	107.12	18.84	79.88	155.12
WHITE	97.72	31.51	11.97	175.78
BLACK	104.24	16.49	75.55	149.51
HISPANIC	118.29	38.20	87.40	247.57
WEST				
TOTAL	96.33	17.25	68.16	141.40
WHITE	92.24	14.65	70.58	137.23
BLACK	108.90	23.49	75.55	171.59
HISPANIC	113.29	18.62	93.12	154.14

Source: Analysis of data provided by DMDC and NPRDC.

Note: IMPU is standardized to a mean of 100 and a standard deviation of 25. Values of 75.55 for the black race/ethnic group and 87.40 for the Hispanic race/ethnic group indicate no quality blacks or Hispanics, respectively, were accessed in a county belonging to the corresponding region.

a. All Services

Tables 14 and 15 show that only one region, the South, had an IMPU for total accessions over the standardized mean of 100 within the small (111.99) and medium (107.12) county groups. Generally, the IMPU for the white and Hispanic race/ethnic groups was greater in the medium county group while the IMPU for the black race/ethnic group was greater in the small county group.

On the surface, the results of Tables 14 and 15 do not support the previous discussion in this chapter that the propensity to enlist is greater in small markets. Tables 14 and 15 imply that propensity to enlist may be more a function of race/ethnicity and geographical region than market size, as earlier speculated. Note that the IMPU by race/ethnic group in the South region is over 100 for all but the Hispanic group in the small county group and the white group in the medium size county group. The IMPU for the white group is greater in the Northeast (108.81) and North Central (100.55) regions of the medium county group. Also note the differences in the IMPU for the Hispanic group by region, with the South and West regions much higher than the Northeast and North Central regions.

Several factors may have contributed to the variation in market utilization by race/ethnicity and geographical region. Race and ethnic group may be a proxy for

economic conditions, particularly income. Without further insight into the relationship between race/ethnicity, economic status, market size, and region, inferences about the differences in the propensity to enlist based on these results should be made cautiously. Propensity to enlist is also a function of the intensity of the recruiting effort in the local geographical area. Smaller counties may not receive the same attention from recruiters as larger counties. Therefore, making inferences without additional insight into the relationship between these variables that determine the propensity to enlist may not be appropriate.

b. Marine Corps

Tables 16 and 17 present the IMPU by region and race/ethnic group based on Marine Corps accessions for the small and medium county groups, respectively. As with market utilization based on accessions from all services, market utilization based on Marine Corps accessions was greater in the medium county group than the small county group, which is also consistent with the analysis of the differences by market size based on accessions from all services.

An analysis of the IMPU by market size, region and race/ethnic group based on Marine Corps quality accessions showed results similar to the IMPU by market size, region and race/ethnic group using accessions from all services with only a few differences. Whereas market utilization by all services

TABLE 16. INDEX OF MARKET POTENTIAL UTILIZATION BASED ON 1990 QUALITY MARINE CORPS ACCESSIONS AND PQMA ESTIMATES, BY RACE/ETHNIC GROUP AND REGION, SMALL COUNTY GROUP

REGION/ RACE/ETHNIC GROUP	MEAN IMPU	STANDARD DEVIATION	IMPU RANGE	
			REGION LOW	REGION HIGH
NORTHEAST				
TOTAL	96.93	23.76	[illegible].78	182.70
WHITE	98.84	21.02	67.76	170.41
BLACK	94.60	22.44	83.87	184.02
HISPANIC	93.08	6.00	91.10	119.64
NORTH CENTRAL				
TOTAL	94.61	25.99	61.55	194.39
WHITE	96.32	22.81	66.62	181.44
BLACK	92.65	16.42	83.87	184.02
HISPANIC	94.50	10.90	91.10	148.18
SOUTH				
TOTAL	104.12	30.84	51.85	268.61
WHITE	102.94	31.10	49.95	245.07
BLACK	107.50	37.03	83.87	384.32
HISPANIC	96.46	18.19	91.10	205.25
WEST				
TOTAL	96.35	25.25	62.82	161.27
WHITE	100.44	29.55	69.23	203.15
BLACK	86.28	9.55	83.87	133.94
HISPANIC	101.80	18.11	91.10	156.33

Source: Analysis of data provided by DMDC and NPRDC.

Note: IMPU is standardized to a mean of 100 and a standard deviation of 25. Values of 83.87 for the black race/ethnic group and 91.10 for the Hispanic race/ethnic group indicate no quality blacks or Hispanics, respectively, were accessed in a county belonging to the corresponding region.

TABLE 17. INDEX OF MARKET POTENTIAL UTILIZATION BASED ON 1990 QUALITY MARINE CORPS ACCESSIONS AND PQMA ESTIMATES, BY RACE/ETHNIC GROUP AND REGION, MEDIUM COUNTY GROUP

REGION/ RACE/ETHNIC GROUP	MEAN IMPU	STANDARD DEVIATION	IMPU RANGE	
			REGION LOW	REGION HIGH
NORTHEAST				
TOTAL	113.77	18.33	87.35	157.51
WHITE	118.22	18.34	90.78	159.17
BLACK	100.68	18.15	83.87	150.64
HISPANIC	101.33	15.06	91.10	159.59
NORTH CENTRAL				
TOTAL	99.59	23.60	65.21	166.82
WHITE	102.64	29.44	71.81	206.55
BLACK	105.25	19.81	83.87	153.97
HISPANIC	102.43	14.56	91.10	129.15
SOUTH				
TOTAL	102.63	21.07	70.93	167.00
WHITE	95.12	22.07	47.13	150.54
BLACK	104.04	18.25	83.87	150.64
HISPANIC	109.02	33.40	91.10	205.25
WEST				
TOTAL	93.90	15.79	66.01	126.28
WHITE	91.79	14.04	67.97	124.33
BLACK	108.71	31.33	83.87	184.02
HISPANIC	109.68	21.32	91.10	176.72

Source: Analysis of data provided by DMDC and NPRDC.

Note: IMPU is standardized to a mean of 100 and a standard deviation of 25. Values of 83.87 for the black race/ethnic group and 91.10 for the Hispanic race/ethnic group indicate no quality blacks or Hispanics, respectively, were accessed in a county belonging to the corresponding region.

was strongest in the South and West regions for the small county market, the Marine Corps had higher utilization in the South (104.12) and Northeast (96.93) regions. In the medium county market, the Marine Corps had the highest IMPU in the Northeast (113.77), followed by the South (102.63) region. Market utilization by race/ethnic group and region by all services and the Marine Corps was generally the same, with the only exception being slight differences in the black race/ethnic group: the Marine Corps better utilized the market potential of blacks in the North Central region of the medium county group.

To summarize, a strong correlation exists between the estimated recruit market potential using the PQMA method and actual quality accessions. This is an expected result because of the use of historical accessions to estimate future accessions from the county. The relationship between estimated and actual accessions did not differ substantially among county groups (small, medium, large and super). However, regional differences in market potential utilization were noted, particularly by race/ethnicity.

Slight differences were found between the relationship of estimated market potential and accessions from all services and Marine Corps accessions (see Tables 11 and 13). The regression results for the black and Hispanic race/ethnic groups for Marine Corps accessions, given the R^2 for total Marine Corps accessions, were comparatively stronger

than were the results of all service accessions for the black and Hispanic race/ethnic groups, given the R^2 for total all service accessions and estimated market potential. Finally, market utilization based on Marine Corps accessions was similar to utilization based on accessions from all services, with minor differences by race/ethnic group and region.

B. HQ QMJ RESULTS

A simple linear regression model was used to explore the relationship between actual quality accessions and the HQ QMJ estimate of recruit market potential for each county grouping. Separate regressions by race/ethnic group were used to explore the ability of the HQ QMJ method to estimate recruit market potential by race/ethnic group. Table 18 indicates the county group and the regression R^2 which is a measure of the goodness of fit for the bivariate regression model.

1. All Services

Similar to Table 11 for PQMA estimates, Table 18 shows that the goodness of fit between actual accessions and estimated market potential using the HQ QMJ method varied by market size and within each race/ethnic group. Again discounting the results of the super county group because of the small number of observations, the relationship, measured by the regression R^2, between total accessions for all services and estimated market potential was strongest in the

TABLE 18. REGRESSION R-SQUARED BETWEEN 1990 ALL SERVICES AND MARINE CORPS ACTUAL QUALITY ACCESSIONS AND HQ QMJ ESTIMATES BY COUNTY AND RACE/ETHNIC GROUP

COUNTY GROUP	R-SQUARED OF REGRESSION FOR TOTAL/WHITE/BLACK/HISPANIC	
	ALL SERVICES	ONLY MARINE CORPS
SMALL	.244/.235/.490/.525	.211/.166/.456/.436
MEDIUM	.068/.087/.661/.562	.088/.149/.546/.418
LARGE	.143/.265/.776/.467	.207/.239/.669/.529
SUPER	.862/.703/.887/.756	.886/.548/.791/.922

Source: Analysis of data provided by DMDC and NPRDC.

Note: Parameter estimates significant at the .05 level.

small county group (.244) followed by the large (.143) and medium (.068) county groups.

Table 18 also shows consistent differences in the R^2 by race/ethnic group. The relationship between actual accessions from all services and estimated market potential by race is stronger for the black and Hispanic groups than the white group across market groups. Also note the differences in the strength of the relationship between R^2 for total accessions and market potential and the R^2 for the black and Hispanic groups. For example, in the large county group, while the R^2 between total accessions and estimated market is only .143 between white, black and Hispanic accessions and estimated market it is .265, .776, and .467, respectively.

2. Marine Corps

The pattern of results between estimated market potential and accessions from all services and the Marine Corps was similar, with the strongest relationship from the small county group (.211) followed by the large (.207) and medium (.088) county groups. Recall that HQ QMJ estimates, like PQMA estimates, do not differentiate between the propensity to enlist in one service over any other; county estimates of HQ QMJ measure the recruit market of all four services. However, the relationship between actual accessions and total estimated market potential in the medium and large county groups, as measured by the regression R^2, is actually stronger between only Marine Corps accessions and estimated market potential than that of all services' accessions and estimated market potential.

The R^2 results measuring the relationship of actual Marine Corps accessions and estimated market by race/ethnic group were similar to those for accessions from all services and estimated market. The relationship between actual accessions from all services and estimated market potential by race is stronger for the black and Hispanic groups than the white group across market groups.

3. Market Utilization

To explore further the relationship between actual accessions and HQ QMJ estimates of market potential, the index

of market utilization (see Chap IV, Section A) was calculated for each county group. As with Table 12 for the PQMA estimates, Table 19 displays the IMPU for each county group based on HQ QMJ estimates. Note that the IMPU is greater than 100 in the small and super county groups. Discounting the results of the super group because of the small number of observations (n=8), the results of Table 19 support the findings of Bicaksiz (1992) that, using the HQ QMJ estimates of recruit market potential, propensity to enlist may be a function of market size.

TABLE 19. STANDARDIZED MEAN INDEX OF MARKET POTENTIAL UTILIZATION BY COUNTY GROUP, HQ QMJ METHOD

COUNTY GROUP	MEAN IMPU	STANDARD DEVIATION	IMPU RANGE	
			GROUP LOW	GROUP HIGH
SMALL	104.30	25.93	57.54	176.93
MEDIUM	93.47	19.97	60.06	173.36
LARGE	88.38	21.88	64.50	194.64
SUPER	118.99	83.50	60.20	317.92

Source: Analysis of data provided by DMDC and NPRDC.

Note: IMPU is standardized to a mean of 100 and a standard deviation of 25.

4. Regional Differences in HQ QMJ Results

To determine if the relationship between actual accessions and estimated market potential differs across regions, counties were grouped by U.S. Bureau of the Census regions. Separate regressions were used to determine the R^2

of actual accessions with HQ QMJ by region, race/ethnicity, and county group. As with the analysis of the PQMA method, because of the small number of observations in the large and super county groups, regional comparison of the relationship between actual accessions and HQ QMJ estimated market potential was limited to the small and medium county groups. Table 20 displays the results of the regression analysis by county group, region, and race/ethnicity for all services' and only Marine Corps' accessions.

TABLE 20. R-SQUARED OF REGRESSION RESULTS BY REGION, COUNTY AND RACE/ETHNIC GROUP, HQ QMJ ESTIMATES AND ACTUAL ACCESSIONS

COUNTY GROUP/REGION	R-SQUARED OF REGRESSION FOR TOTAL/WHITE/BLACK/HISPANIC	
	ALL SERVICES	ONLY MARINE CORPS
SMALL	TOT/WHT/BLK/HISP	TOT/WHT/BLK/HISP
NORTHEAST (n=58)	.303/.162/.888/.948	.411/.184/.869/.797
NORTH CENTRAL (n=79)	.276/.241/.622/.373	.202/.145/.519/.271
SOUTH (n=104)	.426/.383/.448/.589	.203/.173/.340/.641
WEST (n=30)	.147/**.128**/.365/.376	**.052**/**.035**/.178/.274
MEDIUM		
NORTHEAST (n=28)	**.052**/**.012**/.789/.849	**.094**/**.003**/.692/.626
NORTH CENTRAL (n=17)	.540/.436/.944/.246	.294/**.193**/.578/**.151**
SOUTH (n=36)	.339/.334/.943/.912	**.035**/.188/.795/.826
WEST (n=22)	.366/.386/.816/.588	.400/.291/.720/.585

Source: Analysis of data provided by DMDC and NPRDC.

Note: Parameter estimates significant at the .05 level except those that are in bold figures, which were not significant at the .05 level.

a. All Services

Table 20 indicates that the strength of the relationship between actual accessions and estimated market potential varied not only by race/ethnicity but also by region and market size. Using the regression R^2 as a measure of goodness of fit, in the small county group, the relationship between total accessions from all services and estimated market was strongest in the South region (.426) followed by the Northeast region (.303). In the medium county group, the relationship was strongest in the North Central region (.540) followed by the West region (.366).

By race/ethnic group, the relationship between quality accessions from all services and estimated market potential varied not only by region but also market size. The relationship for the white group was stronger in the North Central and South regions. The relationship between accessions and estimated market for the black race/ethnic group in the small markets was stronger in the Northeast (.888) and North Central (.622) regions; in the medium county group the North Central (.944) and South (.943) regions. For Hispanics, the relationship between accessions and estimated market was stronger in the Northeast (.948) and South (.589) regions in the small county group; in the medium county group the Northeast (.849) and South (.912) regions.

b. Marine Corps

An analysis of only Marine Corps accessions generally reveals a similar pattern in the relationship between quality accessions and estimated market by market size, region and race/ethnic group. The relationship between Marine Corps accessions and estimated market was strongest in the Northeast region (.411) in the small county group and in the West region (.400) in the medium county group. The relationship between Marine Corps quality accessions and estimated market for the black and Hispanic groups by region and market size was similar to that of all service quality accessions and estimated market potential.

5. Regional Differences in Market Utilization

Similar to Tables 14 and 15 for PQMA estimates, further insight into the regional differences in the relationship between actual accessions and HQ QMJ estimated market potential can be found by examining the results of Tables 21 and 22 which present the index of market potential utilization by race/ethnic group and region for the small and medium county groups, respectively.

a. All Services

Table 21 shows that, for the small county group, utilization of market potential was generally much greater in the South and West regions for all race/ethnic groups.

Another interesting result from Table 21 was the small standard deviation for the black group in the Northeast and South regions. However, note the large standard deviation in the West region. Further study of the counties in this group revealed only five of the 30 counties had an IMPU over 100, indicating local market variation from the regional mean for the black race/ethnic group was greater in the West region than in the Northeast and North Central regions.

Table 22 demonstrates that the medium county group had only one region, the South, with an IMPU for total accessions over 100. As with Table 21 for the small county group, note the relatively small standard deviation for the black race/ethnic group in the Northeast, North Central and West regions indicating local variation from the regional mean utilization rate for this group was less than that for the white and Hispanic groups.

TABLE 21. INDEX OF MARKET POTENTIAL UTILIZATION BY RACE/ETHNIC GROUP AND REGION, HQ QMJ ESTIMATES, SMALL COUNTY GROUP

REGION/ RACE/ETHNIC GROUP	MEAN IMPU	STANDARD DEVIATION	IMPU RANGE	
			REGION LOW	REGION HIGH
NORTHEAST				
TOTAL	88.06	15.65	62.17	131.34
WHITE	91.81	18.38	61.88	142.93
BLACK	95.41	6.28	91.19	124.39
HISPANIC	92.02	22.80	82.97	240.93
NORTH CENTRAL				
TOTAL	98.54	18.79	60.61	148.61
WHITE	103.46	21.25	61.69	160.56
BLACK	99.48	17.21	91.19	173.30
HISPANIC	97.11	28.19	82.97	269.91
SOUTH				
TOTAL	118.49	27.28	61.77	176.93
WHITE	115.97	28.96	60.73	182.81
BLACK	101.58	8.32	91.19	157.50
HISPANIC	108.77	34.47	82.97	240.64
WEST				
TOTAL	101.68	29.03	57.55	172.10
WHITE	105.27	31.93	57.90	186.92
BLACK	110.70	65.22	91.19	437.24
HISPANIC	100.01	13.72	82.97	141.92

Source: Analysis of data provided by DMDC and NPRDC.

Note: IMPU is standardized to a mean of 100 and a standard deviation of 25. Values of 91.19 for the black race/ethnic group and 82.97 for the Hispanic race/ethnic group indicate no quality blacks or Hispanics, respectively, were accessed in a county belonging to the corresponding region.

TABLE 22. INDEX OF MARKET POTENTIAL UTILIZATION BY RACE/ETHNIC GROUP AND REGION, HQ QMJ ESTIMATES, MEDIUM COUNTY GROUP

REGION/ RACE/ETHNIC GROUP	MEAN IMPU	STANDARD DEVIATION	IMPU RANGE	
			REGION LOW	REGION HIGH
NORTHEAST				
TOTAL	76.88	12.14	60.06	109.52
WHITE	78.50	14.17	56.60	115.19
BLACK	94.84	2.86	91.19	103.58
HISPANIC	90.45	4.55	82.97	98.86
NORTH CENTRAL				
TOTAL	95.55	15.77	70.68	126.59
WHITE	97.64	17.37	72.86	132.74
BLACK	97.28	4.25	94.24	111.54
HISPANIC	93.82	9.37	82.97	115.63
SOUTH				
TOTAL	105.30	22.42	70.95	173.36
WHITE	95.18	17.98	67.86	135.44
BLACK	107.23	52.75	91.19	414.59
HISPANIC	109.12	20.60	82.97	173.08
WEST				
TOTAL	93.60	10.53	73.92	111.84
WHITE	94.69	10.72	74.91	117.63
BLACK	97.59	7.19	91.19	119.46
HISPANIC	104.27	12.96	89.18	136.83

Source: Analysis of data provided by DMDC and NPRDC.

Note: IMPU is standardized to a mean of 100 and a standard deviation of 25. Values of 91.19 for the black race/ethnic group and 82.97 for the Hispanic race/ethnic group indicate no quality blacks or Hispanics, respectively, were accessed in a county belonging to the corresponding region.

Also note the lack of market utilization in the Northeast region in both the small and medium county groups, particularly the IMPU range for Hispanics in the medium county group. While the mean IMPU for the Hispanic group is similar among the small (92.02) and medium (90.45) county groups, note the standard deviations are very different (22.80 and 4.55, respectively). Further examination of the 86 counties in the Northeast region from the small and medium groups showed that only nine had an IMPU for the Hispanic race/ethnic group over 100.[17]

An analysis of the results in Tables 21 and 22 indicates that market utilization was generally greater in the small county group than in the medium county group across both race/ethnic and regional divisions. However, market utilization by race/ethnicity differed across regions. From the two tables, market utilization of the black and Hispanic race/ethnic groups was greater in the South and West regions. Market utilization of the white race/ethnic group was greater in the North Central and South regions.

These findings support earlier conclusions that the results of the regressions of actual accessions to HQ QMJ estimated market potential demonstrated a stronger relationship for the black and Hispanic race/ethnic groups in

[17]The counties in the Northeast region from the small and medium groups with an IMPU for Hispanics over 100: Kent, DE, Barnstable, MA, Merrimack, NH, Sussex, NJ, Ulster, NY, Wayne, NY, Berks, PA, Chester, PA, and Mercer, PA.

the South and West regions. Whether these trends are a result of differences in the propensity to enlist in the military by region and race/ethnic group warrants future research.

b. Marine Corps

Tables 23 and 24 display the IMPU by market size, race/ethnic group and region based on Marine Corps accessions for the small and medium county groups, respectively. The IMPU results based on total Marine Corps accessions by market size and region for Marine Corps accessions followed the same pattern as the total IMPU for accessions for all services (South region the highest IMPU, followed by the West, North Central and Northeast regions). However, there were differences in the IMPU based on Marine Corps and all service quality accessions by race/ethnic group within regions and market size.

TABLE 23. MARINE CORPS ACCESSIONS, INDEX OF MARKET POTENTIAL UTILIZATION BY RACE/ETHNIC GROUP AND REGION, HQ QMJ ESTIMATES, SMALL COUNTY GROUP

REGION/ RACE/ETHNIC GROUP	MEAN IMPU	STANDARD DEVIATION	IMPU RANGE	
			REGION LOW	REGION HIGH
NORTHEAST				
TOTAL	90.49	13.31	70.89	132.33
WHITE	93.81	14.83	69.62	136.92
BLACK	98.64	32.21	86.15	276.41
HISPANIC	101.37	49.02	91.49	444.77
NORTH CENTRAL				
TOTAL	99.79	23.81	67.67	184.88
WHITE	104.19	26.29	70.51	201.58
BLACK	91.98	9.17	86.15	129.49
HISPANIC	98.01	28.27	91.49	327.80
SOUTH				
TOTAL	114.54	32.48	72.65	216.46
WHITE	112.41	34.06	69.78	222.49
BLACK	111.61	35.86	86.15	323.97
HISPANIC	97.40	15.85	91.49	163.29
WEST				
TOTAL	99.75	23.74	65.36	163.63
WHITE	102.51	25.42	67.67	173.01
BLACK	89.00	9.66	86.15	128.07
HISPANIC	103.06	17.91	91.49	171.42

Source: Analysis of data provided by DMDC and NPRDC.

Note: IMPU is standardized to a mean of 100 and a standard deviation of 25. Values of 86.15 for the black race/ethnic group and 91.49 for the Hispanic race/ethnic group indicate no quality blacks or Hispanics, respectively, were accessed in a county belonging to the corresponding region.

TABLE 24. MARINE CORPS ACCESSIONS, INDEX OF MARKET POTENTIAL UTILIZATION BY RACE/ETHNIC GROUP AND REGION, HQ QMJ ESTIMATES, MEDIUM COUNTY GROUP

REGION/ RACE/ETHNIC GROUP	MEAN IMPU	STANDARD DEVIATION	IMPU RANGE	
			REGION LOW	REGION HIGH
NORTHEAST				
TOTAL	84.30	10.87	70.88	105.84
WHITE	86.82	12.01	68.30	112.63
BLACK	94.38	13.73	86.15	150.67
HISPANIC	97.79	7.84	91.49	120.84
NORTH CENTRAL				
TOTAL	97.20	16.41	75.08	138.92
WHITE	98.95	15.68	76.93	131.81
BLACK	103.48	21.70	86.15	171.32
HISPANIC	104.22	17.84	91.49	143.54
SOUTH				
TOTAL	105.10	25.65	76.11	190.41
WHITE	94.80	17.42	72.30	131.53
BLACK	101.99	12.42	86.15	137.81
HISPANIC	103.58	19.50	91.49	155.89
WEST				
TOTAL	92.33	7.91	80.46	108.14
WHITE	93.24	8.44	81.42	106.92
BLACK	101.14	30.00	86.15	202.82
HISPANIC	103.42	10.37	91.49	135.47

Source: Analysis of data provided by DMDC and NPRDC.

Note: IMPU is standardized to a mean of 100 and a standard deviation of 25. Values of 86.15 for the black race/ethnic group and 91.49 for the Hispanic race/ethnic group indicate no quality blacks or Hispanics, respectively, were accessed in a county belonging to the corresponding region.

From the small county group, the IMPU for the black group was higher in the South and Northeast regions, while the IMPU for the Hispanic group was higher in the West and Northeast regions. These differences in the IMPU of all service and Marine Corps only quality accessions based on HQ QMJ estimates were similar to the differences in the IMPU of all service and Marine Corps only quality accessions based on the PQMA estimates of market potential. These results may indicate that the propensity to enlist is a function of region, the propensity to enlist is service specific, or that the Marine Corps allocates its recruiting resources differently than the other services.

In the medium county group, the IMPU based on all service accessions for the white race/ethnic group was higher in the South and North Central regions. The IMPU based on Marine Corps accessions followed the same pattern. However, while the IMPUs for the black and Hispanic groups based on all service accessions were higher in the South and West regions based on Marine Corps accessions, the IMPU for these race/ethnic groups was higher in the North Central and South regions in the medium county group.

To summarize, the correlation between actual accessions and estimated market potential using the HQ QMJ method varied substantially by market size, race/ethnic group and region. Generally, the relationship between black and Hispanic accessions and estimated black and Hispanic market

potential were strongly correlated; the relationship between white accessions and estimated market potential was comparatively weaker. An analysis of the utilization of market potential, measured using a standardized index, determined that the utilization of market potential was generally stronger in the small county group, signifying that, holding other factors affecting the decision to join the military constant, the propensity to enlist by youths in smaller markets may be greater than that of youths in larger markets. However, differences in utilization by market size, race/ethnic group and region were found between all services and the Marine Corps. Finally, the relationship between actual accessions from all services and estimated market differed by race/ethnic group and region, with stronger results for the black and Hispanic groups in the South and West regions, and for the white group in the North Central and South regions.

C. COMPARISON OF PQMA AND HQ QMJ

A simple linear regression model was used with the PQMA estimate of market potential as the independent variable and the HQ QMJ estimate of market potential as the dependent variable for each county group. Separate regressions by race/ethnic group were also conducted to examine the relationship between the two estimates by race/ethnicity. Table 25 indicates the county group and the regression R^2 of

the model for total estimated market and each race/ethnic group.

TABLE 25. R-SQUARED OF REGRESSION RESULTS BY COUNTY AND RACE/ETHNIC GROUP, PQMA ESTIMATES AND HQ QMJ ESTIMATES

COUNTY GROUP	R-SQUARED OF REGRESSION FOR TOTAL/WHITE/BLACK/HISPANIC
SMALL	.319/.279/.566/.599
MEDIUM	.102/.066/.700/.595
LARGE	.289/.276/.755/.794
SUPER	.882/.724/.944/.948

Source: Analysis of data provided by DMDC and NPRDC.

Note: Parameter estimates significant at the .01 level.

Table 25 shows that the goodness of fit between PQMA and HQ QMJ estimates of recruit market potential varied by both race/ethnicity and market size. Discounting the results of the super county group because of the small number of observations in the group (n=8), the strongest relationship (.319) between the two estimates occurred in the small county group. The large county group (.289) had a similarly strong relationship, however the regression results of the medium county group (.102) indicated a weaker relationship between the PQMA and HQ QMJ estimates in this group. Table 25 also indicates that the relationship between the PQMA and HQ QMJ estimates of recruit market potential was stronger for the black and Hispanic race/ethnic groups than the white group.

To give additional insight into the relationship between PQMA and HQ QMJ estimates of recruit market potential, an index of the ratio of market estimates (IRME) was constructed to identify counties with estimates of PQMA and HQ QMJ that varied from the county group mean. For each county, the ratio of PQMA to HQ QMJ estimates was compared to the ratio of the mean PQMA and HQ QMJ estimates for the county group and multiplied by 100. The index was then standardized to a mean of 100 and a standard deviation of 25 for each county group to facilitate easy comparison. Thus, the index of the ratio of market estimates (IRME) was:

$$IRME_{ad} = 100 \times \left[\frac{PQMA_{ad}}{HQ\ QMJ_{ad}} \div \frac{MEAN\ PQMA_{d}}{MEAN\ HQ\ QMJ_{d}} \right]$$

where *a* is the county and *d* is the county group (small, medium, or large). A value over 100 for a county indicates that the ratio of PQMA to HQ QMJ estimated market for the county was larger than the ratio of mean PQMA to mean HQ QMJ.

Using the standardized index of the ratio of market estimates, the counties with a ratio of PQMA to HQ QMJ that deviated more than one standard deviation from the mean ratio of PQMA to HQ QMJ for the county group were identified. Table 26 displays an example of the results and the index of market potential utilization for the respective estimate and county. Appendix A contains a full listing of the counties with a ratio of PQMA to HQ QMJ that deviated more than one standard

deviation from the mean ratio of PQMA to HQ QMJ for each county group.

TABLE 26. EXAMPLE OF COUNTIES WITH INDEX OF THE RATIO OF MARKET ESTIMATES (IRME) MORE THAN ONE STANDARD DEVIATION FROM THE COUNTY GROUP MEAN IRME

COUNTY	IRME	PQMA	HQ QMJ	IMPU	
				PQMA	HQ QMJ
SUFFOLK, MA	58.4	2365	406	87.5	60.1
ORANGE, CA	73.4	15144	1325	84.2	67.4
KALAMAZOO, MI	73.7	2865	163	78.3	74.4
DUPAGE, IL	73.6	4548	395	138.5	75.5
CLARK, WA	128.2	4116	102	91.4	110.4
GENESEE, MI	142.1	8095	194	83.1	108.1
CADDO, LA	150.3	3638	71	81.2	119.6
EL PASO, TX	199.0	8049	121	145.2	194.6

Source: Analysis of data provided by DMDC and NPRDC.

As listed in Appendix A, 92 of the 271 counties (33.9 percent) in the small county group had an IRME plus or minus one standard deviation from the mean IRME. Of the 92 counties, 47 had an IRME less than one standard deviation below the mean IRME (17.3 percent of the small county group) and 45 had an IRME more than one standard deviation above the mean IRME (16.6 percent of the small county group).

From the medium county group, 30 of the 103 counties (29.1 percent) had an IRME plus or minus one standard deviation from the mean IRME. Of the 30 counties, 15 had an IRME more than one standard deviation below the mean (14.5 percent of the

medium county group) and 15 had an IRME more than one standard deviation above the mean (14.5 percent of the medium county group).[18]

Of the 41 counties in the large county group, 10 (24.4 percent) had an IRME plus or minus one standard deviation from the mean IRME. Five of the 10 counties (12.2 percent of the large county group) had an IRME more than one standard deviation below the mean. Five of the 10 counties had an IRME more than one standard deviation above the mean (5.9 percent of the large county group).

The results shown in Table 26 and Appendix A provide two insights. First, counties with local variation between the measures of market potential, as measured by the ratio of PQMA to HQ QMJ, were identified. These counties had ratios of the estimates of recruit market potential different than the mean ratio of estimates for counties within the group, indicating that one of the estimates is over- or under-stating the market compared to the group mean.

For example, Suffolk, MA (Table 26) had an IRME of 58.4, indicating that the ratio of PQMA to HQ QMJ is substantially smaller than the mean ratio of PQMA to HQ QMJ for the county group (100). However, the IMPU for both estimates is below 100. According to the index of market potential utilization,

---

[18]The percentage of the number of counties in the medium group one standard deviation above and below the mean IRME do not add up to the total number of counties plus or minus one standard deviation from the mean due to rounding.

the market was under-utilized according to both estimates of the qualified and interested market. An alternative interpretation is that both estimates had overstated market potential.

Kalamazoo, MI had an IRME of 73.7. However, note that while the HQ QMJ estimate for Suffolk, MA (405.59) is more than twice that of Kalamazoo, MI (163.44), the PQMA estimate for Kalamazoo, MI (2864.99) is about 20 percent more than the PQMA estimate for Suffolk, MA (2364.75). Possible reasons for the differences between the two counties include the over-statement of market potential based on the HQ QMJ estimate in both counties, the over-statement of market potential based on the PQMA estimate for Suffolk, MA, and/or the under-statement of market potential based on the PQMA estimate for Kalamazoo, MI.

Generally, using the index of market utilization to add to the analysis, if the IRME was below 100, either the IMPU based on both estimates was under 100, indicating both estimates may have overstated market potential, or the IMPU based on PQMA was over 100 and the IMPU based on HQ QMJ was under 100, indicating PQMA may have understated and HQ QMJ may have overstated market potential. If the IRME was greater than 100, either the IMPU based on both estimates was greater than 100, meaning both estimates may have understated market potential, or the IMPU based on PQMA was less than 100 and the IMPU based on HQ QMJ was greater than 100, meaning PQMA may

have overstated market potential while HQ QMJ may have understated market potential.

Secondly, by incorporating the index of market utilization with the IRME, the recruiting commands can identify counties by differences in the ratio of PQMA to HQ QMJ from the mean ratio and identify trends by market utilization. This can lend important insight into how recruiting resources are allocated and mission quotas are set, or at a minimum, signal those counties or regions which may require some additional investigation before resource allocation decision and recruiting goals are made.

For example, 14 of the 15 counties (93.3 percent) in the medium group with an IRME more than one standard deviation below the mean IRME were from the Northeast region. Examining the IMPU for these counties, 10 of the 14 counties (71.4 percent) had an IMPU based on the PQMA estimate over 100, indicating market utilization in these counties was better than the mean utilization rate for the group. None of the counties had an IMPU based on the HQ QMJ estimate of over 100. Therefore, HQ QMJ estimates for this region may be overstating market potential.

To summarize, the relationship between PQMA and HQ QMJ estimates of recruit market potential varies by market size and race/ethnic group. Generally, the correlation between the two estimates was stronger in the small and large county groups (.319 and .289, respectively) than in the medium county

group (.102). Across county groups, the correlation between the two estimates was substantially stronger for the black and Hispanic race/ethnic groups than that of whites. Finally, local variation between the two estimates exists. Using an index of the ratio of market estimates, those counties were identified where the ratio of PQMA to HQ QMJ deviated by more than one standard deviation from the ratio of mean PQMA to mean HQ QMJ for the county group.

D. MULTIVARIATE REGRESSION RESULTS

To lend additional insight into PQMA and HQ QMJ as estimates of recruit market potential, a multivariate regression model was used to analyze the relationship between actual accessions, market potential, region, and county nonwhite population percentage. Separate regression analyses were conducted for each measure of market potential (PQMA, HQ QMJ) and for each race/ethnic group both for all service accessions and Marine Corps accessions.[19] Thus, the regression model was:

$$ACCESSIONS = f(QMA, REGION, \% NONWHITE)$$

where region was represented by a set of dummy variables (Northeast, North Central, and West with the South region as

[19]The proxy for county nonwhite population percentage was eliminated for analyses of market estimates by race/ethnic group.

the base case). The sum of black and Hispanic estimated market was divided by the total QMA population and used as a proxy to represent the county nonwhite population percentage qualified for military service in the all race/ethnic group models. As discussed in Chapter III (Methodology), if the measures of QMA have captured the effect of region and socioeconomic status on market potential, the parameter estimates of the region and county nonwhite population percentage are not expected to be found statistically significant.

The county nonwhite population percentage was included as a proxy for income and education status. Counties with a large percentage of minorities have been found to be comparatively poor counties and have lower mean test scores than the national average which is likely to affect adversely the percentage of the county population qualified and interested in joining the military (Kocher and Thomas, 1991). This variable was used to test for the effect of county socioeconomic status on the fit of accessions to recruit market potential. Estimates of recruit market potential have generally been less reliable for minority populations (Curtis, Borack and Wax, 1987 and Thomas and Gorman, 1991).

Table 27 displays the results of the multivariate regression models for the total (all race/ethnic groups) PQMA and HQ QMJ estimates of market potential. Appendix B contains a full listing of the regression results for total accessions

TABLE 27. REGRESSION RESULTS, 1990 TOTAL ALL SERVICE QUALITY ACCESSIONS

PQMA (R^2=.94)			
VARIABLE	COEFFICIENT	STD. ERROR	P-VALUE
INTERCEPT	14.12	2.96	.0001
TOTAL PQMA	0.04	0.0005	.0001
NORTHEAST	-13.09	3.37	.0001
NORTH CENTRAL	-20.13	3.38	.0001
WEST	-13.91	4.08	.0007
% NONWHITE	2.78	8.80	.7538
HQ QMJ (R^2=.64)			
INTERCEPT	71.51	6.89	.0001
TOTAL HQ QMJ	0.53	0.02	.0001
NORTHEAST	-50.26	8.88	.0001
NORTH CENTRAL	-20.12	8.39	.0169
WEST	-4.00	10.29	.6976
% NONWHITE	115.48	47.55	.0156

Note: F-statistic significant at the .0001 level.

by race/ethnic group and for each estimate of market potential (PQMA and HQ QMJ).

1. All Services

Analysis of the bivariate regression results of quality all service accessions as the dependent variable and estimated market potential as the explanatory variable earlier in this chapter found that the relationship of estimated PQMA and HQ QMJ to total accessions was stronger for counties in

the South than was the relationship between estimated market potential and total accessions for counties in the other regions. These inferences were supported by the results displayed in Table 27 and Appendix B for the multivariate regressions analyses with total all service accessions as the dependent variable and market potential, region and county nonwhite population percentage as the explanatory variables.

From the model with PQMA estimate of market potential as an explanatory variable, the parameter estimates for the region dummy variables were all negative and significant, indicating that counties in the Northeast, North Central and West regions had a negative effect on total accessions, other explanatory variables held constant. The model with HQ QMJ estimate of market potential as an explanatory variable had negative and significant parameter estimates for the Northeast and North Central regions, while that of the West region was not significant, indicating that counties in the Northeast and North Central regions had a negative effect on total accessions, other explanatory variables held constant.

The proxy variable representing the county nonwhite population percentage was not significant in the model of total accessions using PQMA as the market potential explanatory variable. This may indicate that the PQMA estimate of market potential accounts for local differences in income and education status that may affect the population qualified for military service and interested in enlisting.

However, in the model of total accessions using HQ QMJ as the market potential explanatory variable, the proxy variable representing the county nonwhite population percentage was positive and significant, meaning that in counties with a large minority population, total accessions were greater than in counties with small minority populations, other factors held constant. This may indicate that the HQ QMJ estimate of total market potential may not be accounting adequately for differences in qualification and propensity to enlist in the service by race/ethnic group. Ideally, an estimate of recruit market potential would account for differences in qualification and propensity to enlist in the military, and the county nonwhite population percentage variable would be found to be not significant. However, in the model of HQ QMJ as a measure of market potential, the regression results indicate actual accessions deviate from estimated recruit market potential due to the racial composition of the market. Alternatively, this may indicate that, since the county nonwhite population percentage variable is a proxy for income and education status, the propensity to enlist is greater in counties with lower than average income and education levels.

The results in Appendix B for regressions of accessions by race/ethnic group and estimated market potential (both PQMA and HQ QMJ) support earlier conclusions based on the bivariate models and the index of market utilization

results. For the white group, the parameter estimate for the North Central region was negative and significant in the PQMA models, indicating that counties in this region had a positive effect on all service white accessions, other variables held constant. The model of quality white accessions and HQ QMJ estimate of market potential had a negatively significant parameter estimate for the Northeast region, indicating that, based on the HQ QMJ estimate of market potential, all service white accessions were negatively affected in counties in the Northeast region, other variables held constant. The parameter estimate for the South region was not significant in either model with PQMA or HQ QMJ as the explanatory variable for market potential.

Based on the regression of all service quality black accessions using PQMA estimates of market potential, the Northeast and North Central regions had a significant negative effect on the number of quality black accessions for the county, other variables held constant. The parameter estimate for the West region was not significant. Based on HQ QMJ estimates of market potential for the black group, the parameter estimates for the Northeast, North Central, and West regions were all negative and significant, meaning, other variables held constant, these regions independently had a significant negative effect on quality black accessions. Also, the multivariate regression results for the black race/ethnic group indicate that the QMA estimates did not

capture regional variation in recruit market potential for blacks.

For the Hispanic race/ethnic group, all region parameter estimates using PQMA as the explanatory variable for market potential and the parameter estimates of the Northeast and North Central regions in the model using HQ QMJ were negative and significant. The West region parameter estimate using HQ QMJ estimate of market potential was not significant. This indicates that for counties not in the South region, the number of quality Hispanic accessions was negatively affected, other variables held constant. These findings support earlier inferences made from the bivariate regression results, that the relationship between Hispanic accessions and estimated market potential was relatively stronger in the South region. Analysis of the index of market utilization for Hispanic quality accessions also supports this finding.

The multivariate regression results indicate that for all race/ethnic groups, systematic variation in the relationship between actual accessions and estimated recruit market potential was found by region. Had the variation in the relationship between accessions and estimated market been confined to just the minority race/ethnic groups, the variation could be due to the generally poor measures of the minority population qualified for military service or socioeconomic status as measured by county nonwhite population percentage. However, since the variation by region also was

found in the white group, this may support the earlier findings that there are differences in the propensity to join the military by race/ethnic group and region.

More importantly, the multivariate regression results indicate that, because variation was found by region and in the county nonwhite population percentage variable, the PQMA and HQ QMJ estimates of recruit market potential are not accounting adequately for differences in the qualification and propensity to enlist in the military by region and local socioeconomic factors. If the estimates were accounting for local differences in qualification and propensity to enlist, these variables would not be statistically significant in the multivariate regression model.

2. Marine Corps

Table 28 displays the results of the multivariate regression models of Marine Corps accessions as the dependent variable and the PQMA and HQ QMJ estimates of market potential. The results from Table 28 (Marine accessions), unlike those from Table 27 (all service accessions) show that the parameter estimates of the dummy variables for region were not significant with the exception of the Northeast region in the HQ QMJ model, which was negative and significant. This indicates that, generally, the relationship between total Marine Corps accessions and estimated recruit market potential

TABLE 28. REGRESSION RESULTS, 1990 TOTAL MARINE CORPS QUALITY ACCESSIONS

PQMA (R^2=.81)			
VARIABLE	COEFFICIENT	STD. ERROR	P-VALUE
INTERCEPT	2.58	0.98	.0086
TOTAL PQMA	0.01	0.0001	.0001
NORTHEAST	2.17	1.11	.0517
NORTH CENTRAL	-0.51	1.11	.6487
WEST	-1.31	1.34	.3294
% NONWHITE	6.02	2.92	.0399
HQ QMJ (R^2=.65)			
INTERCEPT	11.25	1.22	.0001
TOTAL HQ QMJ	0.10	0.004	.0001
NORTHEAST	-4.67	1.58	.0032
NORTH CENTRAL	-0.86	1.49	.5652
WEST	-0.55	1.83	.7618
% NONWHITE	31.45	8.44	.0002

Note: F-statistic significant at the .0001 level.

is not affected by region, other variables in the model held constant.

As with the models of total all service accessions, the results of the regression models for total Marine Corps accessions showed that the proxy variable representing county nonwhite population percentage was positive and significant in both the PQMA and HQ QMJ models. This indicates that the estimates are not adequately accounting for local differences in the qualification and propensity to enlist at the county

level. Also, this may indicate that enlistees to the Marine Corps come from local markets with different demographic characteristics than do all service accessions. Recall that the county nonwhite population percentage variable was not significant in the model of total all service accessions and PQMA estimate of market potential, but it was positive and significant in the model of total Marine Corps accessions.

When separate models were estimated for Marine Corps accessions by race/ethnic group and market estimates (PQMA and HQ QMJ), inferences made previously based on bivariate analyses about the regional differences between Marine Corps accessions and estimated market potential by race/ethnic group were generally supported by the multivariate model. For the white race/ethnic group, the only significant parameter estimate was the Northeast region in the PQMA model, which was positive, indicating that actual white Marine Corps accessions were positively affected in counties in the Northeast region, other variables held constant.

For the black race/ethnic group, all parameter estimates for the region variables were not significant in the model with PQMA as the explanatory variable for market potential. However, in the model with HQ QMJ as the explanatory variable for market potential, the all regions were negative and significant, indicating that for counties not in the South region, the effect of region on black Marine Corps accessions was negative, other variables held constant.

For the Hispanic race/ethnic group, the parameter estimates for all regions in both the PQMA and HQ QMJ models were negative and significant with the exception of the West region in the model with HQ QMJ as the market potential variable as the explanatory variable, which was not significant. This finding also supports earlier results of the bivariate regression model, which found the relationship between quality Hispanic Marine Corps accessions and estimated market potential to be comparatively stronger in the South than in other regions.

Differences in the significance of the region variables between the Marine Corps accession models of PQMA and HQ QMJ estimates of market potential can be explained by the use of historical accessions to estimate PQMA. Because the PQMA estimating procedure uses past accessions to estimate market potential, either differences in the qualification and propensity to enlist by region are accounted for in the estimate or the feedback loop of applying recruiting resources to markets that have been successful in the past leads to a good fit of current accessions to past accessions. The HQ QMJ estimate of market potential is a latent estimate that does not incorporate historical accessions in the estimating procedure.

To summarize, the multivariate regression models used to explore the relationship between total accessions by race/ethnic group, both all-service and Marine Corps, and

estimated market potential, region, and county nonwhite population percentage support the earlier findings of the bivariate regression analyses of quality accessions and estimated market potential by race/ethnic group. More importantly, the results of the multivariate models indicate systematic variation in the fit of actual accessions and estimated market potential by region. These findings indicate that variation in the fit between actual accession and estimated market are due to a failure of the estimates of recruit market potential to account adequately for differences in the qualification and propensity to enlist due to region and socioeconomic status.

V. CONCLUSIONS AND RECOMMENDATIONS

This thesis compared two alternative measures of recruit market potential: Production-Weighted Qualified Military Available (PQMA), currently used by the Marine Corps, and High-Quality Qualified Military Available and Interested (HQ QMJ), a subset of the High-Quality Qualified Military Available estimate of recruit market potential currently used by the Navy. PQMA uses historical quality accessions to determine future market potential. HQ QMJ is based on latent civilian market measures. Recruit market potential estimates used by the Army and Air Force were discussed, but not used in the comparison. The Army and Air Force use estimates of QMA, not qualified military available and interested, which was the primary focus of this study.

PQMA and HQ QMJ estimates were calculated for each county in the continental United States for 1990 using a mainframe computer statistical analysis software package. Counties were then grouped into market size categories based on the number of quality Marine Corps accessions in 1990. Bivariate regression analysis was used to examine the relationship between both all-service and Marine Corps accessions and estimated market by race/ethnic group, market size, and region. An index of market potential utilization was constructed and analyzed to explore market draw relative to

estimated local recruit market potential. To detect variation in the differences between the ratio of PQMA and HQ QMJ at the county level and the market size mean ratio of estimates of market potential, an index of the ratio of market estimates was constructed and analyzed. Finally, a multivariate regression model was used to analyze the relationship between actual accessions, market potential, region, market size, and a proxy variable to represent income and education status at the county level.

A. CONCLUSIONS

Four conclusions can be drawn from the results of this research: (1) the relationship between actual accessions and the PQMA and HQ QMJ estimates of recruit market potential differs by race/ethnic group, market size and region, (2) there are differences in the relationship between actual accessions from all services and Marine Corps accessions and estimates of recruit market potential, (3) local variation was found between PQMA and HQ QMJ estimates of market potential, and those counties with the largest variation were identified, and (4) 1990 PQMA and HQ QMJ estimates of market potential did not account adequately for differences in qualification and propensity to enlist by region and socioeconomic status.

Results of bivariate regression analyses for all-service accessions and estimated market potential by race/ethnic group indicated that the relationship between actual accessions and

PQMA was generally stronger than the relationship between actual accessions and HQ QMJ for total accessions and the white and black race/ethnic groups. The relationship between Hispanic accessions and HQ QMJ was stronger than that of Hispanic accessions and PQMA.

Results of the bivariate regression models and the index of market potential utilization found market size had no effect on the relationship between actual accessions and PQMA. The relationship between accessions and HQ QMJ estimates of market potential was stronger in small market counties as compared to that of counties in medium and large markets.

Bivariate analyses found differences in the relationship between total all-service accessions and estimates of recruit market potential by region, with counties in the South generally having the strongest relationship between total accessions and estimated market for both PQMA and HQ QMJ. Regional differences in the relationship between all-service accessions and estimated market potential by race/ethnic group were also found. Multivariate regression results support these findings. Whereas the multivariate models of total all-service accessions had region parameter estimates that were all negative and significant in both PQMA and HQ QMJ market potential models, separate all-service accession models by race/ethnic group produced region parameter estimates that were either not significant or were positive and significant.

Differences in the relationship between accessions and estimated market potential by region and race/ethnic group, as the results of the bivariate and multivariate regression models indicate, may signify that the propensity to enlist may be a function of both region and race/ethnicity. More importantly, the results of the multivariate models indicate that PQMA and HQ QMJ are inaccurate by race/ethnic segment: the estimates are not accurately accounting for differences in the qualification and propensity to enlist in the military by race/ethnic group and region.

Differences were found in the relationship between all-service accessions and estimates of market potential and Marine Corps accessions and estimates of market potential. Similar to the relationship between all-service accessions, the relationship between Marine Corps accessions and PQMA was generally stronger than the relationship between Marine Corps accessions and HQ QMJ for total accessions and the white and black race/ethnic groups. The relationship between Hispanic accessions and HQ QMJ was stronger than that of Hispanic accessions and PQMA. The relationship between black and Hispanic Marine Corps accessions was comparatively stronger than the relationship between black and Hispanic all-service accessions based on both estimates of market potential.

The effect of market size on the relationship between Marine Corps accessions and estimated market potential was similar to that for all-service accessions: larger markets

had a stronger relationship between Marine Corps accessions and estimated market potential. As discussed in Chapter IV, this may indicate that propensity to enlist is greater for individuals in large markets. Or it may indicate that the PQMA and HQ QMJ estimates of market potential are not capturing the true market, since the effect of market size should be accounted for in both estimates. Had the effect of market size been accounted adequately for in the estimates, differences in market size would not be found in the relationship between accessions and estimated market potential.

Analysis of regional differences in the relationship between Marine Corps accessions and estimated market potential produced some interesting results. Bivariate analyses indicated the relationship of total Marine Corps accessions and both PQMA and HQ QMJ to be relatively consistent across regions. Multivariate regression analyses did not find region to be significant. However, by race/ethnic group, both estimates indicated substantial variation in the relationship between Marine Corps accessions and market potential by region. Generally, bivariate analyses found the PQMA estimate produced a stronger relationship with total and white race/ethnic group Marine Corps accessions by region. The HQ QMJ estimate produced a stronger relationship with black and Hispanic Marine Corps accessions by region.

Substantial local variation was found between PQMA and HQ QMJ estimates of market potential qualified and interested in joining the military. An index of the ratio of market estimates was used to compare the ratio PQMA to HQ QMJ for each county to the market size mean ratio of PQMA to HQ QMJ. Counties with a ratio more than one standard deviation from the county group mean were identified.

Lastly, region and the proxy variable for socioeconomic status (county nonwhite population percentage) were statistically significant in the multivariate regression models examining the relationship of accessions, estimated market potential, region and socioeconomic status. While these results may indicate differences in qualification and propensity to enlist in the military by region and socioeconomic status, they may also indicate that the PQMA and HQ QMJ estimates of market potential did not account adequately for these factors in estimating local recruit market potential. Had these factors been adequately accounted for in the estimates, the region and proxy variable for socioeconomic status would not have been found to be statistically significant in the multivariate regression models.

The conclusions drawn from the results of this research have several implications for the services' recruiting commands, particularly the Marine Corps and Navy, who are users of the PQMA and HQ QMJ estimates of the qualified

military available and interested market, respectively. First, neither estimate compared in this study consistently outperformed the other in terms of its relationship to actual accessions across regions and race/ethnic groups. The deficiency of both estimates may be due to either an inability to account for differences in the qualified military available population and/or the propensity measures applied to the QMA population by region and race/ethnic group. PQMA and HQ QMJ may also have poor estimates of minority populations driving the market potential estimates. Recent 1990 census results should be used to update these estimates. Therefore, the services should continue to examine their use of measures of the qualified military available and interested market in resource allocation and mission distribution decision making process.

Second, the relationship between all-service accessions and estimated market potential and Marine Corps accessions and estimated market potential differed by race/ethnic group and region. This may indicate that there are military branch specific differences in the propensity to enlist by region and race/ethnic group. Therefore, not only must the services have an accurate measure of recruit market potential, they must have an estimate that is *branch specific* to efficiently and effectively allocate recruiting resources.

Finally, in about 31 percent of the counties of the small, medium and large markets (as defined by this study), the local

variation between the ratio of PQMA and HQ QMJ was more than one standard deviation from the market size group mean. The implication of this finding is that for recruiting commands to effectively base resource allocation decisions on differences in local market potential, one estimate of the qualified and interested market may not be sufficient. Neither PQMA nor HQ QMJ was found to have a consistently stronger relationship to actual accessions than the other by market segment and region. Since this research has found that the two alternative measures of market differed by more than one standard deviation from the mean ratio of market estimates in almost one third of the markets used in the study, recruiting commands should further investigate their measures of market in these counties to efficiently and effectively allocate recruiting resources.

B. RECOMMENDATIONS FOR FURTHER ANALYSIS

As the military continues to downsize through the end of the century, the number of accessions will decrease. However, the emphasis on quality accessions will increase and the pressure of efficient use of recruiting resources will increase as budgets are reduced. Therefore, the need for accurate measures of recruit market potential will increase to efficiently and effectively allocate resources to recruit the quality force of the future.

This thesis used one year of enlistment data to determine the relationship between actual quality accessions and estimated qualified military available and interested market. Additional research using several years of recent enlistment data is recommended to support the inferences made in this study. However, this may be difficult since the effects of the United States' involvement in Operation Desert Storm/Desert Shield followed by the planned downsizing of the military may have negatively affected youth attitudes about joining the military, thus possibly changing the relationship between actual accessions and estimated market potential.

Additional research is also recommended in the following areas: the relationship between market size and propensity to enlist, differences in market size and proportion of the youth population qualified for military service, branch specific estimates of market potential, the propensity to enlist and changes to the attitudes of the youth market since Operation Desert Shield/Storm and the end of the Cold War, and differences in the propensity to enlist by race/ethnic group and region. Other sources of civilian sector interest in the military should be explored such as the use of the Youth Attitude Tracking Survey (YATS) and the Armed Services Vocational Aptitude Battery (ASVAB) 18/19 Career Exploration Program, to determine applications in estimating market potential.

The PQMA and HQ QMJ estimates should be updated with the 1990 census population and socioeconomic information to apply the most recent demographic information to estimates of recruit market potential. Further insight into the differences between the PQMA and HQ QMJ estimates of recruit market potential may be gained by applying the same base population estimates to each market estimating method. For example, estimate PQMA using Woods & Poole forecasts of the 17-to-21 year old county population (instead of the U.S. Bureau of the Census population forecasts) and compare the results to HQ QMJ estimates of market potential at the local level.

The Marine Corps, which currently uses PQMA estimates of recruit market potential, should consider incorporating HQ QMJ estimates of recruit market potential for the black and Hispanic race/ethnic groups in its resource and mission allocation decision making process. Since the relationship between black and Hispanic accessions and HQ QMJ was stronger by region than that of black and Hispanic accessions and PQMA, additional insight could be gained by investigating black and Hispanic HQ QMJ estimates of local markets.

Finally, the recruiting commands of the services should investigate further those counties identified as having substantial variation in measures of market potential (a ratio of PQMA to HQ QMJ more than one standard deviation from the market size mean ratio of PQMA to HQ QMJ). Further study into

the local recruit market of these counties should be made to efficiently and effectively make resource allocation and mission distribution decisions.

LIST OF REFERENCES

ASVAB 18/19 Educator and Counselor Guide. Washington, D.C.: Department of Defense, 1992.

Bicaksiz, Adnan, A PC-Based Model for Estimating Regional Recruit Markets. Monterey, CA: Naval Postgraduate School, 1992.

Borack, Jules I., Intentions of Men 23 to 29 Years Old to Join the Military: Results of a National Survey. San Diego, CA: Navy Personnel Research and Development Center, 1982.

Borack, Jules I., Intentions of Women (18-25 Years Old) to Join the Military: Results of a National Survey. San Diego, CA: Navy Personnel Research and Development Center, 1978.

Borack, J. and Govindan, M., Projections of the U.S. Population of 18-Year-Old Males in the Post-1993 Period. San Diego, CA: Navy Personnel Research and Development Center, 1978.

Bowman, William; Little, Roger; Sicilla, G. Thomas; The All-Volunteer Force After A Decade: Retrospect and Prospect. McLean, VA: Pergamon-Brassey's International Defense Publishers, 1986.

Curtis, Ervin W.; Borack, Jules I.; Wax, Stephen R.; Estimating the Youth Population Qualified for Military Service. San Diego, CA: Navy Personnel Research and Development Center, 1987.

Doll, James M., An Optimal Allocation of Recruiter and Facilities in the 12th Marine Corps District. Monterey, CA: Naval Postgraduate School, 1992.

Eitelberg, Mark J., Manpower For Military Occupations, Office of the Assistant Secretary of Defense (Force Management and Personnel), 1988.

Horne, David K., "The Impact of Soldier Quality On Army Performance," Armed Forces & Society 13 (Spring 1987): 443-455.

Horne, Gary E.; Hughes, Jacquelyn S.; Sims, William H.; Evaluation of the USMC OMA-Based Recruiting Goaling System and a Proposed Alternative. Alexandria, VA: Center for Naval Analyses, 1990.

Kocher, Kathryn M. and Thomas, George W., Youth Labor Force in the 21st Century. Draft Technical Report. Monterey, CA: Naval Postgraduate School, 1991.

Laurence, Michael T., Overby, II, John W., and Winter, Phillip E.; The Medical Fitness of American Youth For Military Service, Arlington, VA: Defense Manpower Data Center, 1988.

Moreau, Ellen E., Forecasting High-Tech ASVAB Scores. Monterey, CA: Naval Postgraduate School, 1992.

North, James H., Production-Weighted Qualified Military Availables: A Review and Further Analysis. Alexandria, VA: Center for Naval Analyses, 1991.

Orvis, B.R., Analysis of Youth Cohort Enlistment Intention Data: Progress Report. Santa Monica, CA: The RAND Corporation, 1986.

Orvis, B.R., Forecasting Enlistment Actions from Intention Information: Validity and Improvement. Santa Monica, CA: The RAND Corporation, 1984.

Orvis, B.R., Relationship of Enlistment Intentions to Enlistment in Active Duty Services. Santa Monica, CA: The RAND Corporation, 1986.

Orvis, B.R. and Gahart, M.T., Relationship of Enlistment Intention and Market Survey Information to Enlistment in Active Duty Military Service. Santa Monica, CA: The RAND Corporation, 1985.

Pindyck, Robert S. and Rubinfeld, Daniel L., Econometric Models & Economic Forecasts, Third Edition, New York: McGraw-Hill Inc., 1991.

Scribner, Barry L., Smith, D. Alton, Baldwin, Robert H., and Phillips, Robert L., "Are Smart Tankers Better?: AFQT and Military Productivity," Armed Forced & Society 12 (Winter 1986): 193-206.

Thomas, George W. and Gorman, Linda, Estimation of High-Quality Military Available and Interested. Monterey, CA: Naval Postgraduate School, 1991.

U.S. Air Force/Special Study Team, U.S. Air Force Personnel Force Composition Study: An Analysis of the Effects of Varying Male and Female Force Levels. Washington, D.C.: Headquarters, U.S. Air Force, 1985.

Willis, Grant, "Navy, Marines Meet '92 Recruiting Goal." Navy Times, 12 October 1992, 19.

APPENDIX A. COUNTIES WITH INDEX OF THE RATIO OF PQMA TO HQ QMJ ESTIMATES OF MARKET POTENTIAL (IRME) MORE THAN ONE STANDARD DEVIATION FROM THE COUNTY GROUP MEAN RATIO

SMALL COUNTY GROUP

COUNTY	IRME[a]	PQMA	HQ QMJ	IMPU[b]	
				PQMA	HQ QMJ
CHAMPAIGN, IL	53.71	1182	238	115.33	60.61
SAN FRANCISCO, CA	55.43	2297	380	50.92	57.54
BRAZOS, TX	56.54	1069	159	92.53	61.78
WASHTENAW, MI	58.85	2433	297	86.78	63.30
TIPPECANOE, IN	59.11	1569	188	68.60	61.59
RICHMOND, NY	59.83	1592	181	69.09	62.17
NORFOLK, MA	60.64	3502	376	77.91	63.81
MORRIS, NJ	60.66	2024	217	113.32	68.01
BENTON, OR	61.37	1000	102	71.79	63.64
ALBANY, NY	61.67	1660	167	87.73	65.88
DANE, WI	62.96	3365	312	76.04	65.42
INGHAM, MI	62.98	2979	276	68.66	64.43
ESSEX, NJ	63.01	2956	274	110.01	70.14
TOLLAND, CT	63.87	1160	102	61.30	64.01
MERCER, NJ	64.05	1842	161	64.41	64.58
ALACHUA, FL	64.46	2024	173	101.82	70.45
SAN MATEO, CA	64.61	3729	316	67.95	65.50
SALT LAKE, UT	65.40	5002	407	78.08	67.66
STRAFFORD, NH	65.74	955	76	166.41	81.99

Note a: Index of the Ratio of Market Estimates (see Chapter IV, Section C for a discussion of IRME).

Note b: Index of Market Potential Utilization (see Chapter IV, Section A for a discussion of IMPU).

SMALL COUNTY GROUP

COUNTY	IRME	PQMA	HQ QMJ	IMPU	
				PQMA	HQ QMJ
LANCASTER, NE	65.93	2228	176	121.21	75.04
HUDSON, NJ	66.94	2228	168	99.39	72.51
PASSAIC, NJ	67.19	2115	158	104.59	73.64
BUTTE, CA	68.03	1660	119	125.64	78.24
TUSCALOOSA, AL	68.27	1046	74	152.47	83.34
CHESTER, PA	68.39	2433	172	82.07	70.79
NEW CASTLE, DE	68.56	2547	178	117.84	77.45
ATLANTIC, NJ	69.88	1296	86	78.96	71.45
LEON, FL	70.39	1933	125	121.00	80.13
HAMPDEN, MA	70.40	3115	202	94.97	75.01
KNOX, TN	70.72	2637	169	132.52	82.81
DURHAM, NC	70.99	1114	70	110.94	78.79
OTTAWA, MI	71.32	1455	91	132.72	83.59
MIDDLESEX, CT	71.62	1182	73	83.82	73.87
SANTA BARBARA, CA	71.67	3115	192	76.61	72.41
DAVIDSON, TN	71.96	3365	205	130.44	83.91
SONOMA, CA	72.07	2933	178	90.56	75.66
DISTRICT OF COLUMBIA	72.21	2546	154	79.65	73.49
CASS, ND	72.33	1296	78	107.65	79.52
GLOUCESTER, NJ	72.59	1728	103	136.34	85.95
LAKE, IL	72.68	3502	208	81.18	74.19
RENSSELAER, NY	73.06	1728	101	61.85	70.30
FAYETTE, KY	73.42	2137	123	101.90	79.39
WARREN, NJ	73.63	614	35	149.83	90.23
KALAMAZOO, MI	73.73	2865	163	78.27	74.42
LARIMER, CO	74.05	2729	154	104.29	80.55
CLEVELAND, OK	74.44	2228	124	86.55	76.89
HUMBOLDT, CA	74.96	1182	65	146.79	91.40

SMALL COUNTY GROUP

COUNTY	IRME	PQMA	HQ QMJ	IMPU	
				PQMA	HQ QMJ
PASCO, FL	125.43	3092	62	108.79	135.58
MONTGOMERY, AL	125.75	2979	59	79.23	117.00
SPOTSYLANIA+ FREDERICKSBURG, VA	126.52	978	19	112.01	138.81
HOWARD, IN	127.22	1796	35	93.68	127.62
LORAIN, OH	127.24	5730	112	72.28	113.69
PUEBLO, CO	127.35	2024	40	82.04	120.04
UNION, AR	127.40	546	11	98.00	130.60
FAYETTE, WV	127.99	887	17	141.95	160.07
LINN, OR	128.08	2046	40	96.25	130.11
WICOMICO, MD	128.19	1205	23	70.01	112.91
BELL, TX	129.00	2774	53	132.11	154.86
HERKIMER, NY	129.11	1478	28	70.33	113.82
MARION, IL	129.88	796	15	121.20	148.61
COMANCHE, OK	130.62	2069	39	130.89	156.03
CUMBERLAND, NC	131.30	4684	87	108.12	141.29
ASCENSION, LA	131.51	910	17	118.96	148.95
ORANGE, TX	132.74	1478	27	153.56	174.40
LIBERTY, TX	133.14	910	17	96.95	135.41
SUMTER, SC	133.24	1387	25	130.05	158.66
WASHINGTION, OH	134.56	1501	27	68.93	116.86
MIAMI, OH	134.59	2046	37	85.06	128.35
FLATHEAD, MT	135.75	1319	23	144.45	179.10
PINAL, AZ	135.79	1614	29	85.52	129.71
OKALOOSA, FL	138.22	3388	58	101.55	143.67
FLOYD, GA	139.25	1205	21	86.62	133.53
TERREBONNE, LA	141.92	1796	30	63.42	118.02
AROOSTOOK, ME	142.80	2319	38	79.82	131.34
LAKE, FL	143.28	2001	33	100.38	147.78

SMALL COUNTY GROUP

COUNTY	IRME	PQMA	HQ QMJ	IMPU	
				PQMA	HQ QMJ
CALCASIEU, LA	143.33	3433	56	73.24	126.65
FLORENCE, SC	143.40	1614	26	67.80	122.45
LAPEER, MI	146.66	1842	29	95.47	147.15
MARION, FL	147.33	2751	43	109.48	159.16
HARDIN, TX	147.41	796	12	128.40	174.62
VICTORIA, TX	148.28	1410	22	105.27	156.71
HERNANDO, FL	148.31	1478	23	128.40	175.71
SANTA ROSA, FL	148.71	1774	27	101.62	154.14
BOWIE, TX	149.50	1569	24	72.24	130.56
BAY, FL	151.51	2865	43	114.22	167.58
DOUGHERTY, GA	152.89	1751	26	70.56	131.68
CHRISTIAN, KY	153.29	1091	16	90.13	148.81
TOM GREEN, TX	161.05	2137	30	89.85	155.55
ACADIA, LA	171.83	1137	14	78.08	153.38
COCHISE, AZ	172.64	1933	24	94.36	170.55
JEFFERSON, AR	177.52	1660	20	94.62	175.39
ST. LANDRY, LA	180.92	1410	17	93.09	176.93

MEDIUM COUNTY GROUP

COUNTY	IRME	PQMA	HQ QMJ	IMPU	
				PQMA	HQ QMJ
SUFFOLK, MA	58.42	2365	406	87.51	60.07
NEW YORK, NY	60.39	3092	455	108.79	63.27
NASSAU, NY	62.07	5389	706	82.54	62.11
MIDDLESEX, NJ	62.32	2820	364	119.47	65.92
BERGEN, NJ	64.12	3433	397	84.91	63.73
FAIRFIELD, CT	65.05	3342	367	120.35	68.47

MEDIUM COUNTY GROUP

COUNTY	IRME	PQMA	HQ QMJ	IMPU	
				PQMA	HQ QMJ
DELAWARE, PA	65.42	2820	304	116.43	68.34
NEW HAVEN, CT	65.53	3411	365	133.43	70.54
WESTCHESTER, NY	66.58	3706	376	103.24	67.70
ESSEX, MA	68.09	3547	335	108.82	69.65
MONTGOMERY, PA	70.86	4161	348	90.17	69.09
BUCKS, PA	71.03	3297	274	105.84	71.62
PROVIDENCE, RI	71.87	3456	277	113.17	73.46
HARTFORD, CT	72.34	4957	390	94.00	70.76
BALTIMORE, MD	73.92	3979	295	119.77	76.35
PULASKI, AR	125.58	4275	110	106.58	116.07
EL PASO, CO	126.70	7594	192	86.29	106.75
BALTIMORE CITY, MD	127.69	6071	152	80.62	104.54
CLARK, WA	128.19	4116	102	91.42	110.41
GALVESTON, TX	129.95	3024	74	87.12	109.43
MUSCOGEE, GA	130.10	2592	63	96.62	114.51
SAGINAW, MI	133.27	3684	86	105.57	121.77
MUSKEGON, MI	134.92	2660	61	111.84	126.59
ESCAMBIA, FL	142.88	4798	101	122.32	139.66
JEFFERSON, TX	144.40	3865	80	89.92	121.11
CADDO, LA	150.31	3638	71	81.22	119.62
BRAZORIA, TX	155.10	3411	64	84.78	125.18
HIDALGO, TX	173.02	4252	68	97.18	147.15
CAMERON, TX	174.91	3047	48	104.18	154.23
NUECES, TX	178.62	4343	67	123.66	173.40

LARGE COUNTY GROUP

COUNTY	IRME	PQMA	HQ QMJ	IMPU	
				PQMA	HQ QMJ
MIDDLESEX, MA	63.65	6185	870	116.65	64.50
SANTA CLARA, CA	72.52	9527	864	87.02	67.28
ORANGE, CA	73.45	15144	1325	84.16	67.43
DU PAGE, IL	73.63	4548	395	138.46	75.51
QUEENS, NY	74.75	7867	655	107.[illegible]	71.75
HILLSBOROUGH, FL	136.67	12415	316	100.4[illegible]	113.52
DUVAL, FL	138.52	7981	199	117.93	123.72
GENESEE, MI	142.07	8095	194	83.09	108.02
LAKE, IN	142.74	6958	166	83.50	108.63
EL PASO, TX	198.99	8049	121	145.17	194.64

APPENDIX B. MULTIVARIATE REGRESSION RESULTS

The following tables contain the multivariate regression results for total accessions as the dependent variable and each estimate of market potential (PQMA and HQ QMJ) by race/ethnic group, the set of dummy variables for region (Northeast, North Central, West with the South region as the base case), and the proxy variable for county nonwhite population percentage as the explanatory variables (for the regression of total all service and Marine Corps accessions only). Separate regression analyses were conducted with both all service and Marine Corps quality accessions by race/ethnic group as the dependent variable.

The following tables presents the results of the model using first the PQMA estimate of market potential and then the HQ QMJ estimate for all service total quality accessions, followed by white, black and Hispanic population segment accessions. Similar tables for Marine Corps accessions follow.

TABLE B-1. REGRESSION RESULTS, 1990 TOTAL ALL SERVICE QUALITY ACCESSIONS

PQMA (R^2=.94)			
VARIABLE	COEFFICIENT	STD. ERROR	P-VALUE
INTERCEPT	14.12	2.96	.0001
TOTAL PQMA	0.04	0.0005	.0001
NORTHEAST	-13.09	3.37	.0001
NORTH CENTRAL	-20.13	3.38	.0001
WEST	-13.91	4.08	.0007
% NONWHITE	2.78	8.80	.7538
HQ QMJ (R^2=.64)			
INTERCEPT	71.51	6.89	.0001
TOTAL HQ QMJ	0.53	0.02	.0001
NORTHEAST	-50.26	8.88	.0001
NORTH CENTRAL	-20.12	8.39	.0169
WEST	-4.00	10.29	.6976
% NONWHITE	115.48	47.55	.0156

Note: F-statistic significant at the .0001 level.

TABLE B-2. REGRESSION RESULTS, 1990 TOTAL QUALITY ACCESSIONS, WHITE RACE/ETHNIC GROUP

PQMA (R^2=.92)			
VARIABLE	COEFFICIENT	STD. ERROR	P-VALUE
INTERCEPT	10.26	2.29	.0001
WHITE PQMA	0.04	0.001	.0001
NORTHEAST	-2.90	3.01	.3351
NORTH CENTRAL	-8.85	2.92	.0026
WEST	-4.45	3.65	.2225
HQ QMJ (R^2=.61)			
INTERCEPT	58.35	4.44	.0001
WHITE HQ QMJ	0.43	0.02	.0001
NORTHEAST	-30.45	6.86	.0001
NORTH CENTRAL	-2.14	6.45	.7404
WEST	12.25	8.02	.1272

Note: F-statistic significant at the .0001 level.

TABLE B-3. REGRESSION RESULTS, 1990 TOTAL QUALITY ACCESSIONS, BLACK RACE/ETHNIC GROUP

PQMA (R^2=.94)			
VARIABLE	COEFFICIENT	STD. ERROR	P-VALUE
INTERCEPT	2.03	0.68	.0031
BLACK PQMA	0.04	0.001	.0001
NORTHEAST	-3.11	0.97	.0015
NORTH CENTRAL	-2.43	0.95	.0104
WEST	-1.71	1.15	.1387
HQ QMJ (R^2=.80)			
INTERCEPT	13.50	1.18	.0001
BLACK HQ QMJ	1.66	0.04	.0001
NORTHEAST	-16.65	1.82	.0001
NORTH CENTRAL	-10.25	1.75	.0001
WEST	-14.92	2.12	.0001

Note: F-statistic significant at the .0001 level.

TABLE B-4. REGRESSION RESULTS, 1990 TOTAL QUALITY ACCESSIONS, HISPANIC RACE/ETHNIC GROUP

PQMA (R^2=.42)			
VARIABLE	COEFFICIENT	STD. ERROR	P-VALUE
INTERCEPT	5.46	1.46	.0002
HISPANIC PQMA	0.05	0.003	.0001
NORTHEAST	-6.78	2.30	.0034
NORTH CENTRAL	-6.24	2.22	.0051
WEST	-6.25	2.84	.0282
HQ QMJ (R^2=.58)			
INTERCEPT	5.69	1.23	.0001
HISPANIC HQ QMJ	2.88	0.13	.0001
NORTHEAST	-8.26	1.96	.0001
NORTH CENTRAL	-6.07	1.88	.0014
WEST	-3.37	2.34	.1504

Note: F-statistic significant at the .0001 level.

TABLE B-5. REGRESSION RESULTS, 1990 TOTAL MARINE CORPS QUALITY ACCESSIONS

PQMA (R^2=.81)			
VARIABLE	COEFFICIENT	STD. ERROR	P-VALUE
INTERCEPT	2.58	0.98	.0086
TOTAL PQMA	0.01	0.0001	.0001
NORTHEAST	2.17	1.11	.0517
NORTH CENTRAL	-0.51	1.11	.6487
WEST	-1.31	1.34	.3294
% NONWHITE	6.02	2.92	.0399
HQ QMJ (R^2=.65)			
INTERCEPT	11.25	1.22	.0001
TOTAL HQ QMJ	0.10	0.004	.0001
NORTHEAST	-4.67	1.58	.0032
NORTH CENTRAL	-0.86	1.49	.5652
WEST	-0.55	1.83	.7618
% NONWHITE	31.45	8.44	.0002

Note: F-statistic significant at the .0001 level.

TABLE B-6. REGRESSION RESULTS, 1990 MARINE CORPS QUALITY ACCESSIONS, WHITE RACE/ETHNIC GROUP

PQMA (R^2=.74)			
VARIABLE	COEFFICIENT	STD. ERROR	P-VALUE
INTERCEPT	2.93	0.74	.0001
WHITE PQMA	0.01	0.0002	.0001
NORTHEAST	3.37	0.98	.0006
NORTH CENTRAL	1.01	0.95	.2867
WEST	-0.46	1.18	.6965
HQ QMJ (R^2=.60)			
INTERCEPT	10.06	0.82	.0001
WHITE HQ QMJ	0.08	0.003	.0001
NORTHEAST	-1.90	1.26	.1333
NORTH CENTRAL	1.78	1.19	.1336
WEST	1.35	1.48	.3597

Note: F-statistic significant at the .0001 level.

TABLE B-7. REGRESSION RESULTS, 1990 MARINE CORPS QUALITY ACCESSIONS, BLACK RACE/ETHNIC GROUP

PQMA (R^2=.83)			
VARIABLE	COEFFICIENT	STD. ERROR	P-VALUE
INTERCEPT	0.19	0.22	.4056
BLACK PQMA	0.01	0.0002	.0001
NORTHEAST	-0.38	0.32	.2352
NORTH CENTRAL	-0.36	0.31	.2469
WEST	-0.16	0.38	.6694
HQ QMJ (R^2=.72)			
INTERCEPT	2.19	0.26	.0001
BLACK HQ QMJ	0.30	0.01	.0001
NORTHEAST	-2.79	0.41	.0001
NORTH CENTRAL	-1.74	0.39	.0001
WEST	-2.49	0.47	.0001

Note: F-statistic significant at the .0001 level.

TABLE B-8. REGRESSION RESULTS, 1990 MARINE CORPS QUALITY ACCESSIONS, HISPANIC RACE/ETHNIC GROUP

PQMA (R^2=.40)			
VARIABLE	COEFFICIENT	STD. ERROR	P-VALUE
INTERCEPT	0.80	0.35	.0240
HISPANIC PQMA	0.01	0.001	.0001
NORTHEAST	-1.31	0.55	.0181
NORTH CENTRAL	-1.07	0.53	.0453
WEST	-1.68	0.68	.0137
HQ QMJ (R^2=.54)			
INTERCEPT	0.87	0.31	.0044
HISPANIC HQ QMJ	0.67	0.03	.0001
NORTHEAST	-1.64	0.48	.0008
NORTH CENTRAL	-1.04	0.47	.0260
WEST	-0.94	0.58	.1043

Note: F-statistic significant at the .0001 level.

INITIAL DISTRIBUTION LIST

1.	Library, Code 0142 Naval Postgraduate School Monterey, California 93940-5002	2
2.	Commandant of the Marine Corps Code TE 06 Washington, D.C. 20380-0001	1
3.	Defense Technical Information Center Cameron Station Alexandria, Virginia 22304-6145	2
4.	Professor George W. Thomas Code AS/Te Department of Administrative Sciences Naval Postgraduate School Monterey, California 93940-5002	2
5.	Headquarters, U.S. Marine Corps Code MRP Washington, D.C. 20038	1
6.	Captain David S. Schulz, USMC 6171 Forest Creek Lane Springfield, VA 22152	2
7.	Kathryn M. Kocher Code AS Department of Administrative Sciences Naval Postgraduate School Monterey, California 93940-5002	2